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## THE ASSOCIATION'S WORK DURING 1937 (Part IV)

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**SEVENTH ANNUAL  
CHRISTMAS MEETING  
OF THE  
LABORATORY SECTION**

**ROYAL YORK HOTEL  
TORONTO  
DECEMBER 19-21, 1938**

The annual Christmas meeting of the Laboratory Section is recognized as the occasion for the presentation of new work in all the laboratory fields related to preventive medicine. The importance of the meeting is reflected in the attendance last year of more than one hundred and twenty-five members from all parts of Canada.

Titles of papers should be submitted to the Secretary of the Section, Dr. Ronald Hare, Canadian Public Health Association, 105 Bond Street, Toronto, not later than October 31st. Contributors are reminded that papers may be sent for inclusion in the program even though it may not be possible for the authors to be present to read them.

A special session will be devoted to the presentation of papers on the bacteriology and chemistry of milk, other food products, water, and soil. Contributions from those interested in these subjects are invited.

Abstracts (from 500 to 1,500 words) of all the papers presented will be published in the January issue of the Canadian Public Health Journal.





# CANADIAN PUBLIC HEALTH JOURNAL

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## The Present Problem in Infant Mortality\*

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TWO decades ago, crude infant mortality rates varied over North America in a manner which appeared to have neither rhyme nor reason. Variables, however, which on the one hand favoured and, on the other, harassed the success of local programs were recognized. In 1934, Bellows and Reed (1) published an article on "The Effect of Certain Environmental Factors on Urban Infant Mortality Rates". In this article a table (table I) presented the crude infant mortality rates of twenty cities in the United States of over 100,000 and under 1,000,000, corrected for five factors: temperature, latitude, relative number of foreign-born, relative number of coloured, and of employment in manufacturing and mining. Rates for 1920 were employed, that year being nearest to an available census for population figures accurately divided into the elements necessary for the study. Among the seven cities with the lowest crude infant mortality rates were six cities on the Pacific Coast, Seattle leading with a rate of 56.6. To each of these a substantial correction was considered necessary, ranging from +9 to +28. Seattle and Portland, Ore., retained the lead among the first seven; in fact, among the first ten. Others on the coast did not fare so well. "The first ten cities whose crude rates were all below 80 have marked increases in their corrected rates. The group will be seen to include all of the cities located on the northern Pacific Coast, where climate is relatively favourable. Allowance for this factor, and for the lack of industrialization in the Pacific cities, was largely responsible for the changes in their rates. Adjustment for the small industrial development was the principal correction in the other cities in this low mortality group (the first ten), temperature in this case being a factor of minor importance." (1)

\*Presented before the Section of Preventive Medicine and Hygiene, Academy of Medicine, Toronto, January 7, 1938.

TABLE I

CRUDE INFANT MORTALITY RATES AND RATES CORRECTED FOR TEMPERATURE, LATITUDE,  
RELATIVE NUMBER OF FOREIGN-BORN AND COLOURED, AND EMPLOYMENT IN  
MANUFACTURING AND MINING, 1920 (BELLows AND REED, 1)

City	Infant Mortality Rate		Corrected Rate —Crude Rate	City	Infant Mortality Rate		Corrected Rate —Crude Rate
	Crude	Corrected			Crude	Corrected	
Seattle.....	56.60	77.45	+20.85	Indianapolis.....	90.98	90.11	- 0.87
Portland, Ore.....	59.59	76.91	+17.32	Washington.....	91.01	94.58	+ 3.57
San Francisco.....	61.77	90.50	+28.73	Bridgeport.....	91.91	71.75	-20.16
Minneapolis.....	65.35	76.37	+11.02	Omaha City.....	91.92	93.07	+ 1.15
Oakland.....	66.41	87.33	+20.92	Milwaukee.....	94.06	94.80	+ 0.74
Spokane.....	71.14	94.68	+23.54	Columbus.....	96.36	103.03	+ 6.67
Los Angeles.....	71.34	80.84	+ 9.50	Hartford.....	98.72	92.98	- 5.74
Salt Lake City.....	72.46	90.37	+17.91	Grand Rapids.....	99.11	100.18	+ 1.07
St. Paul.....	73.04	86.04	+13.00	Reading.....	99.34	87.88	-11.46
Albany.....	76.89	89.12	+12.23	Norfolk.....	99.58	82.67	-16.91
Cincinnati.....	82.41	85.92	+ 3.51	Boston.....	100.64	98.82	- 1.82
Akron.....	83.78	72.12	-11.66	Detroit.....	104.19	93.19	-11.00
Rochester.....	84.43	79.70	- 4.73	Syracuse.....	104.66	107.78	+ 3.12
Dayton.....	84.72	82.13	- 2.59	Baltimore.....	105.89	95.92	- 9.97
Springfield, Mass.....	84.82	81.60	- 3.22	Buffalo.....	109.92	113.18	+ 3.26
Worcester.....	85.26	76.03	- 9.23	Pittsburg.....	111.33	111.13	- 0.20
Louisville.....	86.47	81.44	- 5.03	Richmond.....	114.13	100.14	-13.99
New Haven.....	87.02	79.02	- 8.00	Scranton.....	119.00	117.34	- 1.66
Cleveland.....	87.31	77.07	-10.24	New Bedford.....	122.33	91.55	-30.78
Toledo.....	88.58	89.28	+ 0.70	Lowell.....	134.75	115.19	-19.56

In 1920 the infant mortality rate in Vancouver was almost identical with that of Seattle—55 and 56 respectively. We might readily give Vancouver the same correction, raising its rate to 77. But what of the rates in eastern Canada? In the study referred to, the crude rates for Boston, Detroit (at that time about the size of Toronto), Buffalo, and Baltimore, are comparable with the rate in Toronto, being from 100 to 110. These rates, when corrected, were from 90 to 110. The report apparently accepted 72 as the banner rate at that time (Akron, Ohio).

Obviously the corrections were not large. The authors admit this, stating that the study had been based only on the factors most frequently cited as responsible for variations in rates, and adding that they had not been able to reduce the question to one of simple sampling. Obscure factors must have been at work, otherwise one would have had to align the various cities on the sole basis of organization and effectiveness of effort—an unfair affront to many. It would be most interesting to see the results of a similar survey today by the same workers. What would they say of Cleveland, Milwaukee, Detroit, and other cities (table II)? In Detroit, for example, a city now of one and a half million population, the rate in 1935 was 44. The extent of industry has greatly increased. Detroit and other cities, including Toronto, no longer need the correction offered fifteen years ago. If it were granted, they would have lower rates than the Pacific cities. There are other factors to be considered, however. The western cities have many natural advantages which have a favour-

TABLE II  
INFANT MORTALITY RATES, CERTAIN CITIES

City	Population 1930	Infant Mortality Rates					
		1935	1934	1933	1932	1931	1930
Baltimore.....	806,600	57	65	61	63	74	65
Boston.....	782,000	51	58	59	59	61	70
Cleveland.....	902,700	42	45	44	53	54	54
Detroit.....	1,585,600	44	50	51	52	56	65
St. Louis.....	823,200	45	61	45	56	63	54
Cincinnati.....	452,400	64	64	57	55	71	65
Philadelphia.....	1,954,100	48	54	49	52	64	64
Pittsburgh.....	671,000	48	55	53	66	69	69
Providence.....	253,400	46	50	55	60	59	52
Milwaukee.....	580,400	44	45	47	47	58	58
Los Angeles.....	412,300	51	53	57	56	59	62
Seattle.....	366,800	36	41	38	44	41	38
Toronto.....	629,000	56	54	64	63	71	75
Vancouver.....	240,421	28	25	34	42	42	38

able effect upon the infant mortality rate. The eastern cities, knowing their difficulties and recognizing their problems, have provided effective health organizations which have compensated for their lack of these natural advantages.

Let us now consider the infant mortality problems in Toronto (table III). In five-year periods, commencing with the period 1910-1914, the rates were successively 137.0, 103.2, 75.6, 73.9, and 62.0. Two reductions of thirty are found in the infant mortality rates preceding 1925. These correspond with the period of early growth of the public health movement, the accession of paediatrics and, very significantly in Toronto, with the milk-pasteurization program, the chlorination of the water supply, and the attainment of public health personnel to more nearly its required strength. As one might expect, the improvement is most marked in the acute communicable diseases, bronchitis, and diarrhoea and enteritis. The improvement is least marked in the group related to prematurity, congenital debility, and malformations. In the ten-year period 1915-1925 the reduction in this group was 29 per cent. in contrast with the total reduction of 45 per cent. This situation has continued, the percentages being 39 and 55 respectively, up to the present time. The rates for the most recent period, 1931-1935, indicate that minimum rates seem to have been attained in a number of the major causes. The striking exception is the rate for prematurity, congenital debility, and malformations, which group together constitutes 60 per cent. of the mortality for that period. There has been a decline in the number of deaths from these causes but the present high rate cannot be considered satisfactory.

This table (table III) shows clearly that the greatest progress has been made in those fields where our knowledge has been greatest. Diarrhoeal deaths have declined, as has the mortality from the communicable and respiratory diseases. The experience in the province of Ontario parallels that of Toronto. Communities that have applied thoroughly the preventive measures have brought their rates within favourable bounds. These measures include the regular health

TABLE III  
INFANT MORTALITY BY CAUSES, TORONTO, 1910-1935  
(Rates per 1,000 Living Births)

Five-year Period	Live Births	Infant Deaths	PRINCIPAL CAUSES						Still-births	
			*Acute Communicable	Tuberculosis	Bronchitis	Pneumonia	Diarrhoea & Enteritis	Malformations		
1910 Number	57413	7869	267	48	211	593	1691	205	3217	1637
1914 to 1914 Rate	—	137.0	4.7	.8	3.7	10.3	29.5	3.6	55.9	28.5
†1915 Number	74148	7670	327	94	158	971	1063	500	3168	1389
to 1920 Rate	—	103.2	4.4	1.3	2.1	13.1	14.3	6.7	42.7	18.6
1921 Number	65539	4957	149	50	47	559	569	508	2272	803
to 1925 Rate	—	75.6	2.3	.8	.7	8.5	8.7	7.7	34.7	12.2
1926 Number	63638	4704	104	39	21	453	615	425	2219	828
to 1930 Rate	—	73.9	1.6	.6	.3	7.1	9.7	6.7	34.9	13.0
1931 Number	57758	3581	81	23	12	363	517	425	1674	486
to 1935 Rate	—	62.0	1.4	.4	.2	6.3	9.0	7.4	29.0	8.3

\* Includes diphtheria, measles, scarlet fever and whooping cough.  
†A six-year period.

supervision of the infant through well-baby clinics, the safeguarding of the milk supply, the control of the communicable diseases, and the general program of health teaching. These measures have also had some influence on the other causes of infant deaths, but by no means to the same degree. Malformations and other causes peculiar to early infancy have been resistant. When the infant mortality rate for Toronto was 100, these causes constituted nearly 50 per cent.; when the rate was 75, they constituted 55 per cent.; when the rate was 60, they constituted 60 per cent.; and at the present time they constitute 68 per cent. The reason lies in the fact that the usual child hygiene program does not affect to any marked degree these causes of infant death. No program can meet fully the problem, since the causes of malformation and certain other congenital conditions are not known.

In studying the infant mortality rates of Detroit, Pittsburgh, Cleveland, Boston and Philadelphia, comparing in each instance the crude infant mortality rate with the rate for Toronto, and the rate for prematurity, congenital debility and malformations for each of these cities and Toronto, it is found that in each of these cities the extent to which the crude rate is lower than that of Toronto is fully accounted for by the decreased rate for prematurity, congenital debility and malformations. Thus the infant mortality rate for Detroit in 1937 was 9 points lower than that of Toronto, and the rate for prematurity, congenital debility and malformations was 8.9 points lower than the rate in Toronto for these causes. In Pittsburgh in 1937 the infant mortality rate was 5.2 points lower than that of Toronto and the rate for prematurity, congenital debility and malformations was 8.8 points lower. In Cleveland the figures were 7.8 and 7.9, respectively; in Boston (1936), 3.8 and 6.2, respectively; and in Philadelphia (1936), 9.5 and 13.2.

It is to be noted that in each case the advantage accruing from the lowered rates in the group of causes of deaths in early infancy is as great as the advantage in the whole, or greater. In a word, if Toronto could equal the experience of these cities in the rates for prematurity, congenital debility, etc., it would, by virtue of its greater success with the readily preventable causes, equal or excel the records of these cities. Moreover, all of these American cities, Detroit in particular, have within the past seven years at some time had a crude rate much the same as Toronto's, and so one may assume that the newer objective as set by these cities should be attainable here. It is reasonable therefore to assume that Toronto and many other cities in Canada, with their favourable locations, well-organized departments, reasonably suitable population compositions, and other advantages, can equal or excel the figures here shown for several American centres.

Present-day concern over infant mortality relates now, in most places, to only certain of the causes, namely prematurity, congenital debility, etc. May I submit that the cities of the East—and large cities at that—can no longer seek refuge in the plea that corrections are necessary for environmental factors. It has been shown that proper organization will effectively reduce the infant mortality rate of any city. Highly industrialized areas can attain favourable

rates. However, the more mortality rates are reduced, the more resistant and relatively larger become the remaining causes. This is the problem which confronts every community that has a well-organized and effective health department.

The problem of stillbirths and neonatal deaths is an urgent one. With it is associated the question of abortion and miscarriage. Except when self-induced or where criminal interference occurs, these losses have many common roots. Table IV presents a classification of these deaths, almost all of which occur during the first month of life. The majority, therefore, should be considered as neonatal deaths.

TABLE IV  
INFANCY DEATHS, TORONTO, 1936

Under 1 Month		1 Month and Over	
	Number	Percentage of Infant Deaths	Number
<i>Early Infancy</i>			
Prematurity.....	223		9
Debility.....	6		10
Injuries.....	41		2
Other causes.....	31	301	6
		51.5	27
<i>Malformations.....</i>	45	7.7	39
<i>All other causes.....</i>	14	2.3	159
			27.2
	360	61.5	225
			38.5

Considering the difficulties which stand in the way of a more favourable experience in infant mortality, there are two avenues by which to approach the problem: the one to salvage the poorly-born; the other to safeguard motherhood. Neither is simple to accomplish.

In the former, the greatest possibilities relate to prematurity. Special attention is being given in a number of cities to saving the life of the premature infant. In Chicago extensive measures have been instituted. Premature births are required to be notified immediately and the infant is removed to a suitable hospital in a specially equipped ambulance. Such an effort is most laudable and may show us what can be accomplished.

There is another aspect of this problem to which I desire to refer. Attention has been drawn repeatedly to an unfortunate circumstance which prevents the child's getting the attention, care and skill which it requires during the first month of life. These weeks are the borderland between obstetrics and paediatrics. The obstetrician begins to relax his attention at the end of ten days or two weeks. This is true also of hospital cases, in which there may be the added return of mother and child to a home having very unsuitable surroundings. Especially is this true of the unmarried mother and her unwelcome infant. In the case of the premature child the circumstance is accentuated. The welfare of this type of child lies where obstetrics and paediatrics meet. I am not suggest-

ing that this criticism is particularly true of this city or this province, but there is a need for reconsidering the professional care of the premature or debilitated child, particularly with respect to his care through the second half of his first month's existence.

The third observation is the crux of the situation. We can go on indefinitely reclaiming the prematurely born and saving some of the debilitated. We can continue to repair deformity and resuscitate the asphyxiated, but, withal, a large residuum of hopeless cases will continue until intranatal and antenatal hygiene is fully realized and maintained. Prenatal supervision and preventive obstetrics are our only hope. What of congenital malformations? The die is cast for many before birth, as it is for many of the debilitated, but if we are optimistic enough we may hope that even such cases may be restored to health through supervision and suitable environment. To reclaim the handicapped new-born is meritorious but to prevent such conditions must be our objective.

#### REFERENCE

- (1) M. T. Bellows and L. J. Reed: *Am. J. Hyg.*, 20: 565, 1934.

The Seventh Annual Christmas Meeting  
of the  
**LABORATORY SECTION**  
will be held in the  
**Royal York Hotel, TORONTO**  
**DECEMBER 19-21, 1938**  
**See page 524**

# The Demonstration of Types of *B. Typhosus* by Means of Preparations of Type II Vi Phage

## 2. THE STABILITY AND EPIDEMIOLOGICAL SIGNIFICANCE OF V FORM TYPES OF *B. TYPHOSUS*

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**E**XCLUDING special strains (table I), 706 strains† of *B. typhosus* have been typed by means of preparations of type II phage (Craigie and Yen, 1938). In order that all the data presented in this paper might be directly referable to the type strains which were finally selected, all the earlier strains employed in the preliminary work leading to the selection of type strains A to F have been re-examined with phages propagated on these types. It is the purpose of this paper to present observations on the stability of the V form types of *B. typhosus* which have been encountered. It is hardly necessary to point out that, in this connection, the concept of stability is not immediately concerned with the degradation of the V form to the W form. Form-stability and type-stability are different phenomena. Few strains of *B. typhosus* exhibit any outstanding degree of V form stability on repeated subculture. Type-stability of a strain means an absence of change in its type characters which are demonstrable by means of preparations of phage II, as long as the typical V form survives. Thus a type E strain, for example, is to be regarded as type-stable if it remains type E on repeated subculture or after *in vivo* passage, regardless of how frequently the typical V form has to be re-isolated on account of W degradation of the strain. On the other hand, recovery of some other V form type from a strain which originally appeared to contain only type E bacilli would indicate type-instability.

Before strains of *B. typhosus* can be considered to be stable as regards type, evidence must be sought in various directions. It is obvious that unless

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†While cultures of *B. typhosus* of similar type, isolated from different individuals infected from a common source, or from the same individual at different times, may be regarded as cultures of the same strain, it is necessary to use the term "strain" in a much more restricted sense in this paper. While the question of the type-stability of *B. typhosus* is under discussion, the term "strain" will be used to indicate a series of cultures originating from a particular specimen on a particular date. Thus different cultures isolated from different specimens from the same individual will be referred to as different "strains." The term "culture" will be used to denote a particular series of generations of a strain developing in a given tube of broth or agar plate. In accordance with this usage, the word "cultures" (Craigie and Yen, 1938, p. 453, line 16) should read "strains." Since the preceding paper went to press, further series of strains have been typed and epidemiological information has been received concerning others which had been typed but not included in the total of 625 given on p. 453.

the number of types is limited, and there is a striking absence of type intermediates, type-stability would appear to be improbable. Even with a limited number of clear-cut types, the possibility of type-stability cannot be entertained unless strains are found to be homogeneous as regards type and, further, are found to remain so on repeated subculture. With apparently homogeneous, typical V form strains, *in vivo* evidence of type stability is as important as *in vitro* observations made over an extended period of time. If *B. typhosus* can change in respect of its type characters, it is probable that natural transfer in man would offer greater opportunities for such a change than cultural propagation of the organism. For this reason, efforts have been made to obtain as much epidemiological evidence as possible concerning the strains which have been typed.

#### *In Vitro* OBSERVATIONS ON THE STABILITY OF V FORM TYPES OF *B. Typhosus*

In the preliminary phase of this investigation, a number of strains were identified as the types now designated E and F and examination of these strains more than fourteen months later has revealed no change in type. In addition, 146 strains, representing types A, B<sub>1</sub>, B<sub>2</sub>, C, D<sub>1</sub>, E and F have been re-examined after periods exceeding ten months, during which several subcultures were made. All these strains have remained type-stable. In the case of the type strains, a more detailed enquiry has been made. Special cross tests were carried out with two preparations of phage E. One of these was the first generation of type II phage on strain Ty<sub>2</sub> while the other, the most recent, was prepared twelve months later. These phage preparations were tested on the strain Ty<sub>2</sub> (N.C.T.C.) which had been (a) kept at 4° C. without subculture for thirteen months and (b) subcultured, with occasional V form isolation, during this period. Both substrains of Ty<sub>2</sub> were found to be equally sensitive to the critical test dilutions of the phage E preparations as well as equally resistant to heterologous preparations of phage II. Similar observations have been made with other types, but being more restricted in regard to the available homologous phage preparations, they need not be described here. A comparison of classical strains of *B. typhosus* maintained in different centres has provided no evidence of type instability. The strains Ty<sub>2</sub> obtained from the Lister Institute and Dr. Kauffmann of the State Serum Institute, Copenhagen, cannot be distinguished as regards type and this is true also of Watson strains obtained from the same sources. In addition, it is to be noted that the selection involved in isolating the  $\beta$  phase of *B. typhosus* does not affect the type character of the strain (*vide* strain Ty<sub>2</sub> V  $\beta$ , table I).

Special tests have been undertaken in which multiple colony isolations (12 to 20 colonies) have been typed. These, in a number of instances, comprised colonies showing minor differences in appearance. No evidence has been obtained in this way that strains may consist of more than one type of typical V form. However, such evidence alone is not conclusive, since the

random chance of selecting a colony of a dissimilar type would be remote when the latter formed only a very low proportion of the total V forms present. Nevertheless, the evidence regarding homogeneity of type is strengthened by the fact that some of the strains examined in this way were degrading V form strains. Furthermore, the imperfect V form, exhibiting no visible lysis with type II phage, has been isolated from the type strain C by extensive colony isolation after serial transfer in broth. This form has also been obtained from strains of types A and E after similar treatment. In all instances, the typical V form, as long as it retained a sufficient degree of phage sensitivity to permit of its being typed, remained fixed in type. Thus it is evident that the type characters of strains of *B. typhosus* are stable even when cultures of the strains are, as a whole, unstable in regard to form.

#### THE STABILITY OF V FORM TYPES OF *B. Typhosus* IN THE MOUSE

Only a few preliminary observations have been made on type stability in the mouse. Late in 1935 and early in 1936, strains Ty<sub>2</sub> and Rawlings were extensively mouse-passed and thereafter set aside with the minimum of subculture. These mouse-passed substrains are identical in type with corresponding V form substrains not subjected to animal transfer in our hands. A few strains which have been mouse-passed by Dr. M. H. Brown of the Connaught Laboratories have shown no change in type on re-examination by the authors. On the other hand, important evidence concerning the nature of the imperfect V form was obtained from a group of heart-blood cultures from mice inoculated by Dr. Brown with a virulent, imperfect V form strain. This strain had been extensively studied and found to be unable to support the development of type II phage. Single colony subcultures from mice dying of infection with this strain were typed by one of the authors (J.C.) and one was found to be a characteristic type C strain. Investigation of the original heart-blood culture plates, representing 19 mice, yielded the following information. Cultures from fourteen mice appeared to consist only of imperfect V forms, but the cultures from five showed the presence of type C as well as the imperfect V form. No other type of *B. typhosus* was isolated from these mice. The type C colony isolations obtained were all found to be unstable on subculture, becoming imperfect V form cultures after three transfers in broth, agar, and broth, respectively.

#### THE STABILITY OF V FORM TYPES OF *B. Typhosus* IN MAN

The results obtained in typing strains of *B. typhosus* by means of preparations of phage II are summarized in tables II and III. These comprise strains from England and Scandinavia as well as strains from various parts of Canada. All the strains are referable to the type strains selected in the way described in the preceding paper (Craigie and Yen, 1938). As will be seen from table I, classical strains were available as type strains only in the case of types E and F. The strain Ty<sub>2</sub> (N.C.T.C.) was selected as the type E strain and the Rawlings strain (R.A.M.C. rejuvenated—*vide* Perry, Findlay

and Bensted, 1933) as the type F strain. The remaining type strains were obtained from the following localities: Quebec Province (types A, B<sub>1</sub>, B<sub>2</sub>, C, and D<sub>1</sub>); Middlesex, England (type D<sub>2</sub>); Vancouver, B.C. (types G and H); Ontario (type J). It will be noted from tables II and III that the only types encountered with any frequency are types A, B<sub>1</sub>, B<sub>2</sub>, C, D<sub>1</sub>, E and F. Types D<sub>2</sub>, G, and H are represented by only two strains each and type J by four strains. Type J, although identified only recently, was isolated in Ontario as far back as 1929, since the T.G.H. strain, table I, was subsequently found to be of this type. The T.G.H. strain was isolated in Toronto in 1929 from a case of typhoid and had been maintained in the collection of the Department of Hygiene and Preventive Medicine in the School of Hygiene. It is of interest that its preservation was due, in the first instance, to its apparent inagglutinability in typhoid antiserum and that recent examination indicates that it is a relatively stable V form strain.

TABLE I

TYPES REPRESENTED BY SPECIAL STRAINS OF *B. TYPHOSUS* WHICH ARE NOT INCLUDED IN TABLES II AND III

Strain	Type	Strain	Type
Ty <sub>2</sub> (N.C.T.C.) . . . . .	E	Rawlings (R.A.M.C.) . . . . .	F
Tys V (K) . . . . .	E	Watson (N.C.T.C.) . . . . .	F
Ty <sub>2</sub> V $\beta$ (K) . . . . .	E	Watson V (K) . . . . .	F
H901 V (K) . . . . .	E	T.G.H. (isolated in 1929) . . . . .	J
No. 58 (A.M.S.) . . . . .	E		

N.C.T.C.—National Collection of Type Cultures, Lister Institute.

K—Strains received from Dr. F. Kauffman, State Serum Institute, Copenhagen.

R.A.M.C.—Royal Army Medical College, London.

A.M.S.—Army Medical School, Washington, D.C., strain (*vide* Siler et al., 1937).

Table II shows the distribution of types among 418 strains isolated from cases and carriers in the Province of Quebec. These isolations extend over the period December 1936 to August 1938 and were made in the Quebec Provincial Laboratories. Through the kindness of Dr. Foley, epidemiological information has been made available in the case of these strains, with the exception of the last thirty-four. The number of isolations per individual are given in table II. On one occasion, an imperfect V form strain was isolated from a urine specimen, while a degrading (type E) V form was obtained from a stool specimen and a typical (type E) V form from a blood specimen of the same case. In several instances, one or more isolations from a case or carrier yielded only W form strains, while other isolations from the same individual yielded typical V forms. As will be seen from table II, multiple isolations from 46 individuals, all of which yielded typical V forms, were examined. In every case, with one possible exception to be noted later, only a single type was encountered in multiple isolations from an individual. The most striking example of type-stability which has been observed in an individual is provided by a type C carrier. From this carrier, 9 isolations of *B. typhosus*, type C, were made over the period March 8th, 1937 to May 20th, 1938. A simultaneous

comparison of all 9 strains showed that all were identical even in respect of their degree of resistance to heterologous phage preparations.

Throughout the investigation, the grouping of various types in particular localities at given times has been apparent even when evidence of epidemiological relationship has been lacking. In a number of instances which will be referred to, definite epidemiological evidence of transfer of *B. typhosus* was obtained. The largest outbreak of typhoid fever in Quebec Province from which strains have been typed occurred at Lake Megantic, Frontenac County, in November and December, 1937. This epidemic is believed to have been due

TABLE II

STRAINS OF *B. TYPHOSUS* FROM QUEBEC PROVINCE; FREQUENCY OF TYPES AND OTHER DATA

Type of <i>B. typhosus</i>	A	B <sub>1</sub>	B <sub>2</sub>	C	D <sub>1</sub>	D <sub>2</sub>	E	F	G	H	J	Imperfect V forms (a)	Imperfect V forms (b)	W form	Total
No. of strains†.....	32	21	24	81	25	0	144	29	0	0	0	32	5	25	418
No. of individuals... .	24	14	21	63	21	0	120	26	0	0	0	25	4	16*	334
Isolations per individual:															
1.....	17	10	18	54	18	.	103	23	.	.	.	20	3	14*	280
2.....	6	3	3	7	2	.	11	3	.	.	.	4*	1	2*	42
3.....	1	.	.	.	1	.	5	.	.	.	.	1*	.	..	8
4.....	.	.	.	1	.	.	1	.	.	.	.	.	.	..	2
5.....	.	1	.	.	.	.	.	.	.	.	.	.	.	..	1
6.....	.	.	.	.	.	.	.	.	.	.	.	.	.	..	..
7.....	.	.	.	.	.	.	.	.	.	.	.	.	.	..	..
8.....	.	.	.	.	1	.	.	.	.	.	.	.	.	..	1
9.....	.	.	.	.	.	.	.	.	.	.	.	.	.	..	..

\*No. of individuals from whom typical V form was not obtained in any culture.

†See footnote, p. 484.

(a) Sensitive to type IV phage.

(b) Resistant to type IV phage.

to infection of the water supply (Canad. Pub. Health J., 1938). Strains were examined from thirty-seven cases directly involved in this epidemic as well as from seven cases related to it. All forty-nine strains from these forty-four cases were type E strains. Following this epidemic, an increase in the percentage of type E strains submitted from Quebec Province became evident. Type E strains formed 19.2 per cent. of a total of 207 Quebec strains examined prior to the epidemic. Excluding strains related to the epidemic, type E strains account for 30 per cent. of all strains examined since the outbreak occurred. These later type E strains came from cases in counties lying west of the epidemic area and their increased prevalence suggests a series of undiscovered links with the Lake Megantic area. A number of other groups of Quebec cases provide additional evidence of the type stability of *B. typhosus* on human transfer. Instances of transfer of a given type from a case or carrier to a single case were noted on two occasions with type A and also with types B<sub>2</sub>, C, D<sub>1</sub>, E and F. The D<sub>1</sub> strain was transmitted by means of

contaminated ice. In the case of the type F transfer, two further cases of type F infection of unknown origin occurred in the same locality at the same time. The following examples of common source infections were encountered. Two type E cases occurred in one family and were believed to have been infected by the father from whom, unfortunately, no culture was available. Milk was incriminated in the infection of three type E cases in one locality and two type E cases in another. In the latter instance, it was considered possible that the second case may have been infected from the first case and not from the milk. In one place, three type E cases were related to inadequate chlorination of the water supply, and in another, four type C cases were referred to water-borne infection. Suggestive but incomplete evidence of water-borne infection with types A, C, and E respectively was obtained in three groups of cases. In one group of type C infections, four cases were traced to one individual from whom no culture was available for typing. One of these cases infected another case from whom two type C specimens were obtained. The latter case contaminated milk which infected a further case from whom type C was isolated on two occasions.

In the instances which have been mentioned, there is a complete agreement between the epidemiological evidence and the type of *B. typhosus* isolated from the individuals involved. With the exception of four groups of strains which will now be referred to, no possible discrepancies between the results of typing and the epidemiological evidence have been noted in the case of the Quebec series of strains. In one locality, a group of seven cases of typhoid occurred, five being type C infections, one a type E infection, and no culture was available from G.P. who was one of the earliest cases. All the type C cases visited the house of the case G.P. while the type E case did not. G.P.'s infection was attributed to contaminated water, but another case (type C) apparently was infected about the same time although the water supply was considered good. Another type C case drank raw water of doubtful quality as did the type E case who did not visit G.P. In the other cases, there was no evidence of the drinking of contaminated water. In this instance, the evidence regarding the possible role of water-borne infection is not sufficiently clear but, on the other hand, the type E case was the only one who did not visit G.P. on one or more occasions, while the cases who had visited G.P. were infected with type C. Two instances of the association of imperfect V form strains with typical V form strains have been noted. A strain from a mother was found to be type D<sub>1</sub>, while only an imperfect V form strain was obtained from her child whom she infected. In another instance, milk was responsible for the infection of five cases, three of which yielded type D<sub>1</sub> strains, while strains from two were not sensitive to type II phage. If the imperfect V form is correctly interpreted as a partially degraded V form, no discrepancy is involved in these findings.

The only significant discrepancy which we have encountered between epidemiological data and the results of typing *B. typhosus* occurred early in the application of the typing method. Four cases of typhoid occurred in the L. family. One specimen each from L.L. and C.L. yielded type A strains.

From J.L., type A was isolated on three occasions and on a fourth only the W form was obtained. From E.B.L. three specimens were obtained, two of which yielded type A, but the third strain submitted was recorded as type C. Laboratory error in numbering the strains cannot be excluded and it is perhaps suggestive that the strain immediately preceding the E.B.L. type C strain in our series is also a type C strain.

As far as strains from other provinces in Canada (table III) are concerned, the epidemiological information is not quite so complete. However, no discrepancies with the results of typing have been observed and in all cases multiple isolations from an individual have been similar in type. The following instances of transfer of a given type of *B. typhosus* have been noted. In Ontario, a carrier (type B<sub>2</sub>) infected three cases which were also type B<sub>2</sub> infections. Phage II was propagated on all four strains and the preparations were titrated on the type strains as well as the four strains used for propagation. The four phage preparations were found to be identical in relative affinity for the type strains A to F and, within the probable limits of experimental error, of the same absolute titre for the type strain B<sub>2</sub> and for the four case and carrier strains. Among the Ontario cases, transfer of type F from mother to son was noted. From Nova Scotia two groups of related strains were obtained. At a farm house, a carrier infected two cases, all three strains being type B<sub>1</sub>. In a mental hospital, two cases (type F) occurred in relation to two carriers, one of whom yielded a type F strain while only the W form was obtained from the other. Transfer of type F occurred between a case and a carrier in Alberta. A fatal case in this province yielded type E strains from the blood *ante mortem* and from the spleen, gall bladder and jejunum *post mortem*. In one province, a laboratory infection occurred, the infecting strain and the strain from the case being identical imperfect V forms. Among strains from Vancouver, three related type D<sub>1</sub> infections have been noted.

With one exception (excluding the G.P. group of cases) infections where there has been evidence of an epidemiological relationship have yielded only a single type of *B. typhosus*. The exception in question concerns an outbreak in British Columbia which was due to contaminated water. *B. typhosus* was isolated from three samples of water, one strain being type A, another type E, while the third was an imperfect V form. The following types were identified in twenty strains submitted from thirteen cases in the epidemic: types A, C, D<sub>1</sub>, E, G, and H; but in no instance was a case observed to be infected with more than one type. The primitive conditions under which the outbreak occurred would appear to have favoured infection of the water with a variety of types, as well as providing opportunities for other modes of transfer of types of *B. typhosus*.

A total of seventy-four English strains have been examined (table III). The type A strains include four xylose-negative strains from four related Tilbury cases (1938) and two strains from two sporadic cases which occurred in Liverpool (1937). The latter are not known to be connected. The remaining type A strains were obtained from various areas and were mostly

from sporadic cases. Two of the type C strains were obtained from a small epidemic in Wakefield (1936) and five from an outbreak occurring in Lancashire (1938). The type D<sub>1</sub> strains include strains from eight cases involved in the Croydon epidemic (1937), from one individual who was either a carrier or an ambulant case in this epidemic, from one possible late case, and also from the carrier considered to be responsible for the outbreak (Brit. M.J., 1937, 1938; Lancet, 1937, 1938). In 1938, two small outbreaks of typhoid occurred in Chatham and Pembroke respectively. Four strains from the former outbreak and five from the latter were all found to be type D<sub>1</sub>. Strains from eight cases in the Bournemouth-Poole epidemic (1936) were found to be all type E strains. While the final distribution of *B. typhosus* in this epidemic was due to contaminated milk, the infection, in some undetermined way, was undoubtedly derived from a stream polluted by sewage effluent from a house in which a carrier was found to be resident

TABLE III  
STRAINS OF *B. TYPHOSUS* (excluding strains from Quebec Province)

Source of Strains	Type of <i>B. typhosus</i> (the figures indicate the number of strains found to belong to each type)													Imperfect V form	W form	Total
	A	B <sub>1</sub>	B <sub>2</sub>	C	D <sub>1</sub>	D <sub>2</sub>	E	F	G	H	J					
Canada (excluding Quebec Province) ..	23	7	16	25	11	0	32	30	2	2	4	27	11	190		
England.....	17	0	1	8	22	2	14	2	0	0	0	4	4	74		
Norway, Sweden, and Denmark.....	3	0	2	5	2	0	1	5	0	0	0	4*	2	24		

\*Includes one strain from Germany.

(Shaw, 1937). The strain obtained from this carrier and also the strain obtained from the house sewage were found to be type E strains and are similar to the case strains. The two type F strains in the series of English strains were, respectively, the Rawlings strain (R.A.M.C.) and a strain from the epidemic at Malton (1932) from which the Watson strain was isolated (*vide* table I). Of particular interest are two type A strains from a case which was apparently regarded at first as a possible Croydon case (1938 epidemic). This epidemic, as noted above, was a type D<sub>1</sub> epidemic. However, further enquiry regarding this apparent discrepancy revealed that the type A case was an isolated case not related to the Croydon epidemic. It should be added that strains from two cases whose connection with the Croydon epidemic was very doubtful proved to be type A and imperfect V form strains, respectively.

Among the Scandinavian strains (table III), two pairs of type C strains are epidemiologically related. Also related to each other are four type F strains. One imperfect V form strain is epidemiologically related to a type A strain while two strains from one patient were found to be type D<sub>1</sub> and an

imperfect V form, respectively. It is worthy of note that, according to information supplied by Dr. F. Kauffmann, the type A strain and the related imperfect V form strain are both H<sub>2</sub>S-negative and xylose-negative. The type D<sub>1</sub> and the imperfect V form strains from the same patient are Na-citrate-negative. Four of the type F strains are d-tartrate negative while the other type F strain is a  $\beta$  phase strain.

#### THE STATUS OF IMPERFECT V FORM STRAINS

We have expressed the view that the imperfect V form of *B. typhosus* is to be regarded as a degraded variant of the V form. The evidence which supports this view may be summarized as follows. Pure V form cultures, devoid of W forms according to plate test with concentrated type I phage, frequently change on repeated subculture to the imperfect V form. This change has been observed on occasions to occur gradually, the phase of growth during which the strain is lysed by phage II being progressively curtailed in successive subcultures. Strains of types A, C, and E have yielded this form experimentally and an epidemiological relationship has been noted between this form and types A, D<sub>1</sub>, and E. The change from the typical to the imperfect V form appears to be an irreversible degradation *in vitro* for while colony selection may sometimes yield a substrain less degraded than the strain as a whole, the change has always been observed to be in the direction of loss of sensitivity to phage II. The available facts indicate that this loss represents some metabolic deficiency of the strain when cultured *in vitro* and not the acquisition of some positive quality which confers resistance to the phage. If this interpretation is correct, the loss of sensitivity to phage II may justly be regarded as a form of degradation. It is as yet uncertain whether this change is reversible *in vivo* or not. The observations which have been quoted regarding the recovery of unstable type C strains from mice inoculated with an apparently homogeneous imperfect V form strain might perhaps be explained by postulating a small proportion of more invasive type C organisms in the inocula. However, the marked instability of the type C strains which were isolated from these mice suggests that the imperfect V form actually reverted to its antecedent type under the influence of an *in vivo* environment.

It is obvious that when the sensitivity of a strain to phage II has become reduced below a certain level, the strain cannot be typed, for all types of *B. typhosus* converge towards the imperfect V form when they fail to develop sensitivity to phage II. It should, of course, be borne in mind, that sensitivity to lysis by Vi phage at 37° C. is an *in vitro* phenomenon and is largely dependent on the rate of multiplication of the culture and on its age as determined by reference to its growth curve. Typical V forms exhibit the greatest sensitivity to lysis in the early stages of growth and the imperfect V form would appear to be a form in which the cycle of sensitivity to lysis by type II phage is reduced to vanishing point. It cannot, however, be inferred from this that the imperfect V form must necessarily show, *in vivo*, any qualitative

deficiency in the development of Vi antigen. The parallelism between sensitivity to Vi phages and the development of Vi antigen cannot be explained solely on the basis of the affinity between Vi phage and Vi antigen. The phage lyses, not the antigen, but the host cell which is actively elaborating this antigen. Any differences which may exist between the *in vitro* and *in vivo* metabolism of the imperfect V form may thus render invalid any inferences concerning the *in vivo* behaviour of this form which might be drawn from its apparent resistance to phage II. When a series of subcultures, favouring degradation, has intervened between the isolation and phage examination of a strain, the finding that it consists of imperfect V forms can hardly be regarded as being of any greater epidemiological significance than recovery of the W form. On the other hand certain observations, (a) the observed instability of the type C forms obtained by mouse passage of an imperfect V form strain, (b) the recovery of imperfect V forms only from multiple specimens from six individuals (table II), and (c) the case of laboratory infection with this form which has been cited, suggest that rapid degradation *in vitro* may be a significant characteristic of some strains and emphasize the desirability of typing strains as soon as possible after isolation. Admittedly, the imperfect V form requires further study and the view which has been put forward should be regarded meanwhile as a tentative hypothesis. The examination of such forms after mouse passage will, no doubt, provide much useful information concerning them, which cannot be obtained by *in vitro* observation alone.

#### THE LIMITATIONS OF PHAGE TYPING OF *B. Typhosus*

Degrading V form strains do not yield plaques of normal size or appearance with phage II. Since the technique which has been described depends on the use of an accurately determined critical test dilution of phage for the fully sensitive type strain, there is obviously a level of sensitivity below which the results obtained on typing a degrading strain should be interpreted with reserve. Although the strains which we have examined have frequently proved to be mixed V and W form cultures on receipt, plating methods or culture in O serum broth have usually permitted isolation of the typical V form. As will be seen from tables II and III, the imperfect V form was the only V form obtained from 10 per cent. of strains examined. The proportion of strains in which the typical V form was present only in a form exhibiting impaired sensitivity to phage II was lower than this, being approximately 5 per cent. Thus the opportunities of determining the validity of typing results obtained with strains exhibiting partial degradation on receipt have been limited. When a strain exhibits only minute, imperfect and abortive plaques, the results of direct typing will obviously be difficult to interpret. A study of tables III and IV (Craigie and Yen, 1938) may perhaps suggest that it might be difficult to distinguish degrading type A and B strains. Such confusion has actually occurred in two instances. Dr. Kauffmann submitted to one of the authors (J.C.) two strains, nos. 11 and 12. No. 11 was a dwarf

form which, however, proved to be completely sensitive to all phages (type A strain). Strain no. 12 showed no visible reaction with phages B<sub>1</sub>, C, and D<sub>2</sub>, and a varying number of minute to almost microscopic plaques with the other phages. Since these plaques were most pronounced with phage B<sub>2</sub> the culture was regarded as a degraded B<sub>2</sub> type until information was received that strains nos. 11 and 12 were both derived from a strain isolated in 1935. Phage A was therefore propagated from a single plaque to 10<sup>21</sup> through five series of generations on strain no. 12. The phage thus obtained produced confluent lysis on type strain A in a dilution of 5 x 10<sup>3</sup> but failed to produce plaques on any other type strain in a dilution of 5 x 10<sup>2</sup>. Phage 12 in the latter dilution produced only very minute discrete plaques on strain no. 12. However, it was estimated that had these plaques been of normal diameter, the 5 x 10<sup>3</sup> dilution would have produced confluent lysis with this strain. Since strain no. 12 produced a specific, although relatively weak, type A phage, it is therefore a type A strain although it exhibits equivocal reactions when tested directly with typing preparations of phage II. Similar results were obtained with two other strains obtained on two occasions from a case of typhoid fever. The strains were both examined at the same time and the one most recently isolated showed the typical reactions of a type A strain while the other showed reactions similar to strain no. 12. Phage II propagated on the degrading strain was found to be specific for type A, and cross tests of this phage and phage 12 showed identical reactions with the homologous and heterologous strains. It is clear from these observations that caution should be exercised in interpreting the reactions obtained with degrading type A and B strains.

In the case of a few degrading type E strains, it has been observed that the indirect typing method does not always yield reliable results. There is evidence of a relationship between types D and E which is obscured by the specific reactions of the typical V form of these types. D<sub>1</sub> phage is able to multiply to a minor extent on type E strains when transferred from a D<sub>1</sub> strain and this phenomenon is much more marked when a degrading type E strain, which yields only minute plaques, is used. Therefore, until further information becomes available concerning the relationship of types D and E, the reactions of degrading strains of such types, or of phage propagated on such strains, should be interpreted with reserve.

The space which has been devoted to this question of the limitations of the phage method of typing *B. typhosus* overemphasizes, perhaps, the practical importance of the difficulties which have been encountered occasionally. It should be borne in mind that our supply of strains has been largely restricted to strains subcultured for some time before examination. Immediate application of the method to freshly isolated strains will not only eliminate the labour of isolating the V form in nearly every case but should greatly decrease the frequency with which degrading strains are encountered. At the present time, the size of plaques produced would seem to provide the best guide as to whether the strain can be typed without reserve. When the plaques formed are rather small, thus producing a discrete to semiconfluent reaction, but are

uniform in size with no irregular, minute or abortive plaques, the type to which the strain belongs can be determined by estimating whether confluent lysis would have been produced had the plaques been of normal diameter. On the other hand, when the plaques produced are irregular and vary in size down to plaques not readily visible except with a hand lens, the strain should be regarded as being too degraded to permit of its being typed directly. In such cases, indirect typing may be attempted but unless the phage thus obtained shows an unequivocal specificity for one of the type strains, this method, obviously, cannot be relied upon.

#### SUMMARY AND CONCLUSIONS

A total of 706 strains of *B. typhosus* (excluding special strains, table I) have been investigated by the methods described in the preceding paper (Craigie and Yen, 1938). The strains were derived from various parts of Canada, from England, and from Scandinavian countries. No V form was obtained from forty-two strains, while seventy-two strains yielded only the imperfect V form. Of the 592 strains which were typed, 98.6 per cent. were found to belong to groups A, B, C, D<sub>1</sub>, E or F. The percentage of strains successfully typed would doubtless have been greater had a greater proportion been freshly isolated strains.

The types of *B. typhosus* which have been identified by means of preparations of phage II are limited in number and are readily distinguishable. If a small number of strains, exhibiting diminished phage sensitivity and abortive plaque formation, are to be accepted as degrading V forms, no true type intermediates have been encountered. The clear-cut types to which strains of *B. typhosus* belong appear to be stable in character, at least within the limit of our observations. Change of type *in vitro* has not been observed. The type similarity of strains derived from repeated specimens obtained over a period of time from a case or carrier provides further evidence of type stability. There has been a notable agreement of the results obtained by typing strains of *B. typhosus* with the available epidemiological data which, although by no means complete, are probably sufficiently extensive to reveal significant discrepancies if *B. typhosus* is not generally type-stable. The epidemiological observations therefore provide additional evidence of the stability of the types of *B. typhosus* which have been described. It seems reasonable to conclude that the V form types of *B. typhosus* which have been described are sufficiently stable *in vitro* and on human transfer to be of definite epidemiological significance. Thus the recovery of the same type from a carrier and a group of cases may be considered as confirming epidemiological evidence of a relationship between them, or even, under certain circumstances, as indicating an undiscovered relationship. On the other hand, the isolation of different types of *B. typhosus* from apparently related cases would appear to demand further investigation since such a discrepancy would indicate that either the epidemiological information or the concept of type stability of *B. typhosus* was erroneous.

We desire to express our thanks to those who have made this investigation possible by providing us with strains of *B. typhosus* and with epidemiological information concerning them. We are particularly indebted to the following: Dr. C. E. Dolman, Director, Provincial Laboratories, British Columbia; Dr. A. R. Foley, Epidemiologist, Ministry of Health, Province of Quebec; Dr. F. Kauffmann, State Serum Institute, Copenhagen, Denmark; Mr. M. H. McCrady, Director, and Dr. L. P. Lebeau, Bacteriologist-in-charge, Division of Laboratories, Ministry of Health, Province of Quebec; Dr. A. L. MacNabb, Director, Provincial Laboratories, Toronto, Ontario; Dr. W. M. Scott, Ministry of Health Pathological Laboratory, London, England.

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The Seventh Annual Christmas Meeting  
of the  
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**DECEMBER 19-21, 1938**

*See page 524*

# Diphtheria Immunization, with Special Reference to the Local Campaign\*

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FOR a quarter of a century since Behring in 1913 first introduced his toxin-antitoxin mixture, the medical profession has made use of immunization against diphtheria. In 1923, ten years after Behring's discovery, Ramon proposed a modified diphtheria toxin called by him "anatoxine" and generally known as diphtheria toxoid or anatoxine-Ramon. This toxoid has been found to be more efficient than alum-precipitated diphtheria toxoid which was first prepared in England in 1926. Three doses of anatoxine-Ramon at intervals of three weeks give results vastly superior to those obtained by using one dose of alum-precipitated toxoid both in respect of immunity response and duration of immunity. Hundreds of thousands of cases have been immunized and no valid objections to the use of toxoid have yet been sustained; on the contrary, its generous use has been followed by a very great decline in morbidity and mortality.

In Toronto 49,000 school children given three doses of toxoid were observed over a five-year period, 1927 to 1932. There were no deaths from diphtheria in this group, and only one has been since reported, in 1935.

As a result of work done during the past twenty-five years there is general agreement that at the age of six months to one year the great majority of infants are susceptible to diphtheria. Since the Schick test is all important in informing the physician whether an individual is immune or susceptible to diphtheria, either before or after immunization, it is essential that the Schick-test toxin be carefully controlled and standardized. Otherwise, utmost confusion and erroneous conclusions will be the result. According to Dr. J. G. FitzGerald, Toronto, the Schick test as a routine procedure need not be carried out in children between the ages of six months and six years under ordinary circumstances. After immunization it is often desirable to Schick-test children as it is a well-established fact that permanent protection is not always obtained—and the degree may vary in different individuals and with the immunizing agent used.

Practically all the diseases that we are called upon to treat have a multiplicity of remedies and methods of treatment suggested, none of which are specific and positive as to cure. Diphtheria is an outstanding example of a malady for which we have a positive cure in antitoxin and practically a positive preventive in toxoid. Why is it a fact that diphtheria was the chief cause of death in the age-group of 2 to 14 years in Canada in the period 1920-1930? Why were there 201 deaths in Nova Scotia from 1927 to 1936? Surely the blame

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cannot be passed on to the laity. Must our citizens strive to cure themselves of diphtheria as they do from other maladies with spurious drugstore nostrums? We have a greater responsibility in the treatment of diphtheria than in any other disease, for if ordinary medical skill and knowledge are applied, both prevention and cure are practically certain. Of course we have all lost cases of diphtheria and there will be the occasional case that we may not be able to save in the future if we still have diphtheria. If immunization is not universally carried out routinely and made as important as vaccination against smallpox, we will continue to have cases of diphtheria to treat and the undertaker will have cases to bury.

The first record of the use of toxoid in Nova Scotia dates from 1927, when 200 school children were immunized in Wolfville. In 1928, at Dominion No. 6, 300 children received toxoid and in 1929 this work was started in Yarmouth and North Sydney. During 1930, a number of cases were immunized in Whycocomagh, and in New Glasgow immunization has been consistently carried on since 1931. Last year nearly 10,000 children were treated in Cape Breton County—so that Nova Scotia is really taking up the work seriously although toxoiding is not universally popular.

My interest in diphtheria immunization dates from 1923, while spending some time at Johns Hopkins Hospital, Baltimore. The Department of Hygiene at that time was putting on a campaign of immunization in the city of Baltimore. However, it was not until 1928, as medical officer of health of the town of Yarmouth, that the time seemed opportune to interest our local citizens. Dr. Jost, then Provincial Health Officer, promised every possible assistance and stated that all toxoid would be supplied by the Department free of charge.

Early in 1929 I went before the Town Council and explained the idea of immunization. I met with a very cold reception. One of the members, a doctor, advised strongly against it. He said it was only in the experimental stage, dangerous and unsafe. Three months later, in May 1929, we had an epidemic of diphtheria and during the four succeeding months sixty cases were reported, with two deaths and two cases of laryngeal diphtheria saved by tracheotomy. This seemed to be my opportunity. The Town Council, like Pharaoh of old, had refused me permission before, but now I could proceed with my experiment provided no additional financial obligations would be entailed.

My campaign was launched the latter part of August at the beginning of the school term and the following procedure was carried out:

(1) The local press published several articles, which I provided, regarding the seriousness of diphtheria and the wonderful benefits of toxoid.

(2) The manager of the Metropolitan Life Insurance Company secured an educational film on diphtheria immunization and this was shown daily at the local theatre free of charge. Also, the Metropolitan agents carried literature into every home they visited and explained the advantages of toxoid to all their clients.

(3) Consent slips were distributed to all school children to be taken home for the parent's signature.

(4) With the co-operation of the district health nurse, a Saturday morning clinic was established at the Health Centre. This clinic was at once a success.

A record was kept of each child immunized: name, age, address, date, reaction, etc. As many as 95 were treated in one morning. There were no serious reactions and, with only three or four exceptions, every child returned for the three injections. During August and September 495 children were given full immunization.

This work has been carried on ever since by succeeding medical health officers and not one case of diphtheria has developed in a child receiving three doses of toxoid. To-day diphtheria is a rare disease in Yarmouth. Only one case was reported last year.

In conclusion, diphtheria is still a menace. Diphtheria can be controlled by toxoid. In the light of our present knowledge, arguments to the contrary are ridiculous. Deaths from diphtheria to-day are evidence of failure to apply well-known measures of prevention. Who is responsible? It must be placed on our local and provincial health authorities. The public must be educated to the point that they request immunization. The profession also must be educated. My personal experience has been that the Provincial Department of Health is always ready and willing—yes, and eager to give every assistance in health matters generally. A considerable number of members of the medical profession are not co-operating in this effort to prevent diphtheria. Why this apathy and *laissez-faire* attitude? Our responsibility is 100 per cent. immunization of our school children, nothing less. The press, the school, the church, the women's organizations, the service clubs, are all available for educational purposes.

We have made progress in the past ten years but I am certain no conscientious and progressive physician is satisfied with present results. My plea is that the profession will give this problem serious consideration.

# Seasonal Variation in Response of Guinea Pigs to Toxoid\*

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ARRHENIUS and Madsen (1) (1904) expressed the opinion that season is a factor in the resistance of guinea pigs to diphtheria toxin. They did repeated toxicity tests on one lot of toxin from October 1901 to December 1904. Their results indicated an evenly declining toxicity except for the tests done in June and July of 1902 and 1903 when the results fell below the general curve, i.e., more toxin was required to kill during the summer months. Similar findings were reported by Sudmersen and Glenny (2) in 1909. The influence of season on the antitoxin response to specific antigen was studied by Glenny and Waddington (3) in 1928. They subjected guinea pigs to repeated Schick tests at weekly intervals and found that animals started on this procedure during the summer months were more quickly rendered Schick-negative than those started in the winter. Madsen and Schmidt (4) (1932) record a pronounced seasonal variation in the response of their animals to one injection of toxoid. The death rate obtained following a killing dose of diphtheria toxin was used as an indicator of the antibody response to the single toxoid dose. More recently, Procházka and Vanicek (5) (1935) have reported that sera of guinea pigs immunized during the summer months reach higher antitoxin titres than those injected during the winter. Prigge (6) (1937) in investigating some of the factors influencing the accuracy of biological testing, used, among others, guinea pigs from a pure inbred stock and carried out tests in summer and winter. He found that consistently 3 to 4 times as much antigen was required in winter as in summer to protect 50 per cent. of his animals against subsequent lethal doses of toxin.

The present communication is an analysis of data obtained in the routine antigenic testing of diphtheria toxoid at the Connaught Laboratories during the years 1932-1936 inclusive. Some four thousand eight hundred guinea pigs, all from one colony, were used during this period.

From each bottle of toxoid 0.5 c.c. was administered, subcutaneously, to each of ten guinea pigs. After four weeks these animals were Schick-tested with standardized Schick-test toxin. Readings were made on the fifth day, the same criteria being used throughout the five-year period for differentiating the positives from the negatives. After a further two weeks each animal was given at least five minimum lethal doses of toxin. Thus two methods of gauging the

\*Presented before the Laboratory Section at the twenty-sixth annual meeting of the Canadian Public Health Association, Ottawa, June, 1937.

immunity response were used. In this communication discussion is limited to the immunity development as evidenced by the Schick test.

The toxoid was tested, prior to injection, by flocculation with a standardized serum and varied from 18-21 Lf units. There was no concentration of high or low Lf material in any one part of the five-year period (table I).

TABLE I  
SCHICK-POSITIVE RATES AND AVERAGE Lf. OF TOXOID BY SEASON

Year	Summer June-October		Winter and Spring November-May	
	Schick Pos. %	Toxoid Average Lf.	Schick Pos. %	Toxoid Average Lf.
1933	35	20	58	20
1934	30	19	41	20
1935	33	18	65	19
1936	33	20	59	21

As this was not a planned experiment, the distribution of the testing throughout the five-year period is extremely irregular. In 1932 the numbers were very small, reaching a maximum of only 47 pigs Schick-tested in one month, with a total of 264 for the year (table II). Also in 1935 the total was low (353)

TABLE II  
SCHICK TESTS BY MONTH AND YEAR

	1932		1933		1934		1935		1936		Total	
	No. Tested	Schick Pos. %										
January....	3	33	38	71	169	34	65	57	402	61	677	55
February...	20	30	140	66	110	44	83	66			353	56
March.....	10	40	86	69	105	49	19	84	132	89	352	71
April.....	10	40	29	59	11	36	39	64	83	82	172	69
May.....	47	36	99	54	80	34			67	60	293	47
June.....		188	42	50	18		40	35			278	35
July.....	38	29	54	4	218	44			93	49	403	27
August....	47	32	20	40	60	37			198	30	325	32
September..	20	35	107	43	149	31	30	23	69	39	375	35
October....	20	25	99	26	147	42	10	50	195	25	471	31
November..	19	63	20	25	45	55	67	71	158	44	309	51
December..	30	30	100	42					464	48	594	46
Total...	264	35	980	47	1,144	35	353	57	1,861	51	4,602	

(All Schick-test results are listed opposite the date of starting the antigenic test, i.e. the date when the toxoid was injected).

and the distribution irregular. In 1933 the total number of animals tested was 980; in 1934, 1,140; and in 1936, 1,861. With the exception of a few months, the years 1933, 1934 and 1936 show a fair distribution of large groups.

The Schick-test results of each of the 5 years (table II), although showing considerable irregularity in their variation from month to month, have one common feature in that the lowest monthly Schick-positive rate of each year is to be found in one of the summer or autumn months, i.e., June to October.

When the Schick-positive rates for all five years are combined (table II), the tendency to a lower summer rate is more evident. June, July, August, and September and October show Schick-positive percentages varying from 27 to 35; whereas in March and April the rates were 71 and 69 per cent. positive, with the remaining months intermediate between these extremes.

TABLE III

GUINEA PIGS TESTED IN SUMMER AND WINTER WITH PERCENTAGE SCHICK-POSITIVE

Year	Summer June–October		Winter and Spring November–May	
	Number Tested	Schick Pos. %	Number Tested	Schick Pos. %
1932	125	32	139	38
1933	468	35	512	58
1934	624	30	520	41
1935	80	33	273	65
1936	555	33	1,306	59

When the Schick-positive rates for each year are considered in two groups, those for the winter and spring, and those for the summer (table III), the seasonal difference is well demonstrated. For each year the summer Schick-positive percentage is lower than the corresponding winter-spring rate. In 1932, when the fewest pigs were tested, the summer and winter-spring rates were 32 and 38 per cent. respectively. For 1933 the rates were 35 and 58; in 1934, 30 and 41; in 1935, 33 and 65; and in 1936, 33 and 59 per cent. respectively. That these differences cannot be attributed to differences in the Lf values of the toxoid has already been shown (table I).

In further confirmation of the above findings, there are the results of the retesting of 45 lots of toxoid. In this group are included those lots which had to be retested owing to deaths among the test animals. For each toxoid lot one or more tests were started during the winter months and repeated during the summer months (table IV). Of the 546 pigs Schick-tested during the months November to April, 68 per cent. were Schick-positive. In contrast to this the same toxoid tested during the months May to October yielded a Schick-positive rate of 39 per cent.

It may be significant that there is a marked contrast between the fairly uniform summer Schick-positive rates and the widely differing winter-spring

TABLE IV  
RESPONSE TO TOXOID IN REPEATED TESTS OF 45 LOTS

Schick Tests Nov. to April incl.			Schick Tests May to Oct. incl.		
Animals Tested	Schick Positive		Animals Tested	Schick Positive	
	Number	Per cent.		Number	Per cent.
546	372	68.1	445	173	38.8

percentages. The factor or factors causing the depression of the immunity response in the winter and spring vary apparently from year to year. This variation might suggest that diet is an important factor, as during the summer an adequate supply of green feed is regularly available, as a rule, whereas during the winter, and especially the spring, the supply of greens varies considerably in different years.

#### CONCLUSIONS

Confirmatory evidence is presented that the immunity response in guinea pigs to diphtheria toxoid, as measured by the Schick test, shows a seasonal fluctuation, being higher in summer than in spring and winter months.

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# The Public Health Nurse in Venereal-Disease Control\*

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**S**YPHILIS, as a danger to public health, as a peril to the family, as a menace to the vitality, health and physical progress of the race, presents greater problems than any other communicable disease. Lacking the essential facts about the disease, the public places a stigma on infected persons, causing such persons to refrain from seeking early diagnosis. The public must be informed regarding the disease. They must know that it is transmitted directly, indirectly, and congenitally and that there is no natural immunity and no cure without specific treatment. The fight against venereal disease is made more difficult because of the closely associated problems of prostitution, immorality, and the consumption of alcohol. Any program to control venereal disease requires consideration of the provision, in health education, of instruction in regard to sex.

It is not the purpose of this paper to discuss the etiology of syphilis but it is necessary to stress the importance to nurses of a thorough knowledge of the disease. Since the control measures involve legal matters, it is impossible to conduct venereal disease nursing in a generalized plan of public health nursing. Special nurses are usually appointed. It should be remembered, however, that the responsibility in finding new cases lies not only with the nurse doing venereal disease work but with the practising physicians and all members of the public health department. There are a number of ways in which cases can be found ; e.g., syphilis is a communicable disease and is reportable. However, it is generally recognized that reporting is incomplete. Death registrations are also a means of locating cases but in most instances syphilis is not given as the cause of death. As the nurse comes in contact with her patients to render any type of service, she should bear in mind the symptoms of adult and congenital syphilis and urge a general physical examination where such symptoms are observed. Lack of knowledge of syphilis on the part of the public health worker may mean that a mother will have a syphilitic baby. In such a case the best-planned prenatal teaching has failed. Similarly, lack of knowledge of syphilis may mean that a case of interstitial keratitis in a school child is considered to be "pink eye", without the opportunity of a diagnosis being made by the attending physician.

When a patient is first admitted to the clinic, he should enter a clean, well-equipped unit without waiting any longer than necessity demands. It must be remembered that the first impression is lasting and much can be done in the first interview to establish a feeling of confidence on the part of the patient.

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The interview must be private and the nurse's attitude one of sympathy and understanding, impressing the patient that her interest is primarily for the treatment and control of the disease, rather than the moral issue. He must be told the seriousness of his condition and impressed with the necessity of prolonged, uninterrupted treatment and the importance of protecting others.

The nurse's understanding of human nature comes much into play in that first interview. It may be possible then to determine the source of the infection, but if the patient is reticent, it is well to leave the matter of the source till his confidence has been won, rather than force a statement which may or may not be true, and which makes him hesitant to admit later that he had given wrong information. Nevertheless, the nurse must never forget that in the control of syphilis the sources and contacts must be located and examined, and the patient must be assured that in no way will he be embarrassed by giving the information sought. All patients should have a complete physical examination, not only from a standpoint of diagnosis but also to permit of the treatment of any other conditions that he may present. Generally, at the end of one year's treatment, examination of the cerebro-spinal fluid is made and, if the tests are satisfactory, the patient is permitted to discontinue regular attendance at the clinic. On his departure he is given a copy of "Instructions for Patients" (part of Form VI, Regulations respecting Venereal Diseases, Department of Health of Ontario).

There is much that the nurse can do to assure the regular attendance of patients at the clinic. By constant courtesy to her patients, by manifesting interest in them, and by attention to many little details, the nurse creates an atmosphere which encourages the return visits of the patients. A patient is apt to refuse treatment due to a blunt needle or the lack of privacy in preparation or in treatment. Care of her equipment, so that treatments may be given with the least amount of pain or discomfort, is highly important. Clinic hours should be arranged at a time when those seeking treatment find it convenient to attend.

As the treatment is continued over the months, there is the problem of regular attendance. As symptoms disappear, there is the tendency toward lapsing in treatment. An appointment is made for each patient for his return visit. If a patient who is in the acute infectious stage does not return for the second treatment, he is visited at once. As a routine, visits are made at intervals of two weeks. In the event of the patient's not returning for treatment, he must be visited to determine the reason for his absence and impressed with the fact that insufficient treatment constitutes a grave danger not only to himself but to others, as they may be infected by him. If he then fails to resume treatment, a letter from the medical officer of health may be sent to him requesting an interview, and if the medical officer of health fails to persuade him, the patient is then given Form IV which, under the Act, makes treatment compulsory. Failing all this he must appear before a judge.

There is much to be taught to patients from the point of personal hygiene—the necessity of cleanliness of the body and clothing; the necessity of the separate washing and sterilizing of dishes and linen during the infective period;

the necessity of carrying out the physician's instructions in regard to diet ; the drinking of sufficient water to insure proper action of the kidneys ; the importance of regular bowel movements, since mercury or bismuth are cumulative in the body ; the need of rest and fresh air ; and the necessity for care of the teeth.

The nurse and the physician share a responsibility with the patient in urging him to discuss his condition with the members of his family and others with whom he has come in contact, advising examination.

In order to protect a family or individual, much of the follow-up work is done in the clinic. It may be that a young man or woman receiving treatment is boarding and the nurse's presence in the home is difficult to explain ; or that in going to an industrial plant, the nurse is the cause of a job being lost, which is unnecessary. Public opinion is so influenced by the moral consideration that many persons would refrain from any contact whatever with a syphilitic patient. Again, if the patient is a boy or girl over 16, living with his parents and desirous of withholding this information from the parents, the nurse must respect this desire and keep the confidence of the patient. However, advise these youngsters to take the parents into their confidence. In this group it is important that the nurse visit the home, on some pretext or other, in order to become acquainted with home conditions and, if possible, help if home conditions are contributory to the young person's delinquency. Help may be given through recreational facilities such as association with a Y.W.C.A. or Y.M.C.A. or an interest in various church activities. In the marital group, time must be given the one infected to present the problem to the other to insure the least possible damage to the home, but eventually the members of the family must be examined.

Co-operation with other services, such as organizations doing pre-natal, post-natal, infant and other types of service, is made difficult owing to the legal aspect of the disease and it would seem essential that a common ground within the law be found, so that the concerted effort of all interested in public health should be used to the best advantage. Nurses detecting possible symptoms of congenital or adult syphilis can only advise that the patient see a physician and request a complete physical examination, or that the physician be taken into confidence in regard to his condition and treatment sought. If a patient tells the nurse of her condition or if the nurse detects it herself, the medium of approach is always through the medical officer of health.

The finding of sources and contacts is one of the most difficult tasks of venereal disease work. In some cases the patient will seek diagnosis of his own free will, and also bring those with whom he has been in contact, but this is not often the case. The nurse must make repeated enquiry as to sources and contacts, impressing the patient with the fact that her interest is purely from a public health attitude to control the further spread of the disease. On being given a name as a source or contact, the nurse visits the home after credible information which she has received has been signed by the informer. She explains that she is the recipient of information which states that he has been in contact with an infectious disease, and requests that an examination

be made either by a physician or at a clinic. If this is not done, the person is given a form which demands this examination under the Venereal Diseases Act. The medical officer of health has wide authority in the enforcement of the Venereal Diseases Act in all the Provinces.

In preventive measures, much depends on the education of the public and a change in the attitude towards those infected with syphilis. A Wassermann test should be a routine in hospital and doctors' offices, especially in pregnancy and before marriage. Syphilis is not only a disease of the socially inadequate, but infects all classes of society, so that knowledge of the dangers of syphilis does not hold the key to the situation, and very little has been gained through fear. A person may become greatly impressed by a motion picture or a presentation of the sequelae of syphilis, but is the impression lasting? Sex education starts in youth. The training that a child receives is permanent and lasting. If a parent will frankly confront the first questionings in childhood, truthfully and directly, without too much detail, it is surprising how easily and naturally children go through adolescence. The child must be impressed with the fact that his information is gained only through his parents, and should not be discussed with other children. They must be taught personal hygiene and a profound respect for their genitals. If a parent finds that her vocabulary is insufficient to express herself directly, truthfully and unemotionally, much literature is available which will be of help to her. Children respond well to instructions of honourable fair play, and are anxious for the approval of those with whom they come in contact; and if they are respectful and chivalrous to their parents, they will be so to others. A boy's attitude to the girls whom he admires will be a reflection of his attitude toward his mother and sisters—one of fair play. Literature for growing children should be carefully chosen and if the habit of reading good literature is started it should be permanent. There is no outside influence which can compare with good home training and as a group we all know how difficult it is to teach a code of morals and honour to a sex delinquent. Clean living, good sportsmanship and a square deal is the foundation of good citizenship and must be taught from earliest youth in the home. This early training, in which the nurse can be of assistance, may help reduce the amount of extra-marital sex-relationships. In certain countries much has been done in personal prophylaxis after contact. However, the standard of personal prophylaxis which is abstinence from sexual relationships and personal intimacies except in normal marriage, has no substitute and no competitor.

# Some Industrial Skin Lesions\*

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**I**T is impossible in the time allotted to deal with this subject extensively. Even the outstanding features would occupy the greater part of a long paper. I shall, therefore, speak of the important principles involved, with a few illustrations.

For our purpose, cutaneous lesions from the standpoint of compensation may be considered in three groups.

First are those caused by heat and cold, or, in other words, burns and frost bite. The former are quite commonly met with, the latter rarely. Both are familiar and, therefore, require little comment.

Second are those due to common irritants, whether acting directly on the skin, or indirectly following absorption. There is scarcely a chemical known to which some individual is not susceptible, and this group, therefore, contains the most difficult problems from a standpoint of determining the origin and of making a diagnosis.

Third are lesions which are self-inflicted, sometimes by the hysterical, but more often by the malingering type of individual.

To deal with this classification in reverse order, the characteristic features of self-originated skin lesions are their site of accessibility, their varying character, and their constant resistance to ordinary methods of treatment. These features, of course, may occur in many types of skin lesions, but, considered along with the mental reaction of the individual, make the picture quite characteristic. They usually occur on the upper or lower limbs. One has seen most extensive lesions of the upper arm inflicted by biting. Lesions on the lower limbs are usually inflicted by common objects, such as pins, needles or hairpins. A remarkable thing is the persistence of the subject in inflicting the injury in spite of frequent serious and painful results. A case in point is that of a patient who complicated a simple superficial infection over the sacrum by picking it with a pin, resulting in repeated abscesses, which ended only at the heel. These abscesses required numerous operations, yet each succeeding operation was followed by an infection lower down. Occasionally another method of producing a lesion is resorted to, namely, wrapping a rope or tight band about the limb, producing oedema, or of causing friction by a rope or band, producing a superficial circular scarification. These are usually detected readily.

There is but one treatment for these self-inflicted lesions that is satisfactory:

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that is a thorough cleansing of the lesion, and then encasing the part in a plaster-of-Paris cast. This not only protects the part from external interference, but is a definite and unmistakable hint to the patient that the cause of the condition is known. It is unusual to find a recurrence.

A rare condition which causes suspicion to fall on the sufferer is superficial gangrene of the skin. This lesion begins following an infection in the part as a dry mummification of the surrounding tissues. It is usually first noted as a small circular depression with a tough, leathery, brownish base. Progress is usually rapid, the lesion widening in area and frequently becoming multiple. Not infrequently these lesions deepen beneath the skin, invading the muscular tissue and, if unchecked, result in haemorrhage. The original gangrenous area can only be likened to that produced by carbolic acid and this drug as a causative factor must first be excluded. The condition is a serious one and most resistent to treatment. We have at present such a case, who has successively lost finger, hand, forearm, upper arm, and finally disarticulation of the humerus, in an endeavor to keep ahead of the process. We are convinced that this lesion is not of self-inflicted origin. The shoulder above the disarticulation is now involved. An excision of the gangrenous area by the electro-surgical unit has on two occasions arrested the process and resulted in healing followed about two weeks later by a breakdown. Fortunately these cases are rare, but when they occur are most discouraging.

In a province where manufacture of chemicals is not a feature of industry, claims for compensation for skin lesions due to chemical irritants are not common. However, they do occur and usually the experience is that only about 50 per cent. can be definitely traced to the claimant's occupation. In this regard, however, it is important to note that patch tests are not wholly reliable so far as a negative reading is concerned, as workers producing a negative patch test at the physician's office to a chemical with which they are working, may suffer a definite reaction when exposed to the same chemical in the workshop. The only method of proof in such cases is to expose the worker under his working conditions and watch results. The following classes of workers are most frequently susceptible: leather workers; treers; tanners; seasoners; food-handlers; general house workers; laborers; workers handling metals, minerals and acids; printers; painters; mill workers; garage workers; plumbers; and glue workers. All these occupations give rise to various forms of dermatitis. When present on the hands it is extremely difficult to distinguish the dermatitis from an ordinary eczematous eruption. Usually distinction by inspection is impossible. The occupation of the worker, history, and careful examination of the whole body will sometimes give a clue to the truth. On the other hand, the worker may sometimes have to be removed from his environment and the condition studied before a conclusion can be definitely reached.

Cement workers, during cold weather, are particularly susceptible to a dermatitis which originates from a chapping of the hands due to cold and wet, permitting the cement to act as an irritant. The same applies also to female factory workers who, washing their hands in hot water just before leaving the

factory, go out into the cold with the hands insufficiently protected. Chapping frequently follows when those even mildly susceptible to any irritant become the subjects of a dermatitis.

In the coal mining industry a dermatitis affecting the hands is not uncommon. Miners themselves attribute it to what is commonly termed copperas water. A careful analysis of this water, which contains in solution salts of copper, iron, calcium and sulphur, shows little to indicate that it is the causative factor, but such waters in the mine frequently have a high bacterial content and minute lesions in the skin may result in a superficial sub-acute infective process.

Pulpwood peelers, who are susceptible, frequently get a dermatitis from the sap, particularly the sap of the fir tree.

As I intimated at the beginning, burns and frost bite are so well known that they need only to be mentioned. Their results, however, are not always easily handled, particularly in the case of burns. The treatment of scars from burns is one involving in frequent instances the utmost skill and resource of the plastic surgeon. Undoubtedly, treatment with tannic acid in solution or in the form of jelly has reduced the mortality from burns and diminished the extent of scar tissue. The addition lately of a small percentage of silver nitrate to the spraying solution has reduced the number of applications which are necessary and has resulted in the formation of a softer coagulum.

It is worth mentioning, with reference to frost bite, that in any but the superficial cases, a prophylactic injection of gas-gangrene antitoxin is highly desirable. Many of these cases are treated first in camps where the standard of cleanliness is not too high and man's closest companion is the horse. Under such circumstances this simple precaution may be a life-saving measure.

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### PRACTICAL ASPECTS OF THE IDENTIFICATION OF SPECIFIC TYPES OF TYPHOID BACILLI

THE report published in this issue by Craigie and Yen deals mainly with the question of the epidemiological significance of the types of typhoid bacillus which they described in the September issue. Questions relating to the nature and behaviour of the particular phage employed for the demonstration of Craigie and Yen's types must be referred to workers in the virus field. Bacteriologists and epidemiologists, on the other hand, will be directly interested in the claim that distinct types of *B. typhosus* can be recognized by means of Vi phage. Craigie and Yen found that 98.6 per cent. of 604 typical V form strains belong to one or other of six main types. They report observations which indicate that their types of *B. typhosus* are stable on human transfer as well as *in vitro*. If confirmation of this is forthcoming, the epidemiologist will have at his disposal the study of typhoid fever by a method superior to the mere recognition of an enteric pathogen as *B. typhosus*. The tracing of a transfer of a given type of *B. typhosus* would undoubtedly be more satisfying to the conscientious epidemiologist than the tracing of this bacterial species without regard to type. Indeed, the epidemiologist might be embarrassed on occasion to learn that the carrier to whom he has traced an outbreak is harbouring a type dissimilar to that infecting the cases which he has presumed to have infected, or that cases presumed to have been infected from a common source present a diversity of types of *B. typhosus*.

The method of typing *B. typhosus* was described in the September issue of this journal. The types of *B. typhosus* recognized by Craigie and Yen are represented by specially selected type strains. Phage preparations which have been specifically conditioned to these type strains are used as reagents for the identification of the types to which strains under examination belong. The principle involved is that phage conditioned to a given type strain will specifically attack all strains similar in type. The ultimate standard of reference is, of course, the type strains and not the phage preparations which are conditioned to these type strains. Using freshly isolated strains of *B. typhosus*, which have not had an opportunity to degrade, it should be possible in the laboratory to determine the type within 24 hours. Once the necessary phage preparations have been obtained, tested, and standardized, the method of typing *B. typhosus* is simple and rapid. As mentioned above, Craigie and Yen found that 98.6 per cent. of 604 typical V form strains belong to one or other of six main types. Since only

five phage preparations, supplemented by a second test with phages B<sub>1</sub> and D<sub>1</sub> when types B and D are recognized, are required to identify the types which form 98.6 per cent. of the strains, it would seem to be unnecessary to test for all types in the first instance. This restriction of the tests necessary in the case of the majority of strains is an important consideration from the point of view of the routine laboratory.

The authors do not speak of the significance of their findings in relation to the preparation and use of typhoid vaccine. During the past four years this subject has been studied intensively by those responsible for the preparation of typhoid vaccine in Great Britain and other countries. The findings of Craigie and Yen will permit of a new approach to the problem of obtaining a preventive vaccine of the greatest value. In the field of serum therapy these observations may make possible important advances. In the past, conflicting results have been reported regarding the treatment of typhoid fever patients with sera from immunized animals. Information as to whether these types are of immunological importance as well as of epidemiological importance will be awaited with interest. Craigie and Yen's types may also prove of interest to the clinician if they exhibit significant differences in virulence. From many angles the establishing of specific types of the typhoid bacillus may be a contribution of major importance.

#### THE CANADIAN RURAL HEALTH CONSERVATION CONTEST

THE movement for full-time rural health services in Canada is making steady progress. Seven new units have been established this year. In several of the provinces, however, only a start has been made. In contrast, more than two-thirds of the rural population of the province of Quebec are provided with health services on a full-time basis. The Canadian Public Health Association believes that through its Committee on Rural Health Services valuable assistance may be given in advancing the movement for full-time rural health services. The success of the first Canadian rural health conservation contest, conducted last year by the Association with the co-operation of the American Public Health Association and the W. K. Kellogg Foundation, is ample evidence of the interest and support of the provincial departments of health and of the administrative officers of the rural health units in this effort of the Association.

The value of the contest is twofold: it affords to the medical officer the opportunity for reviewing critically his program; and it fosters in the community an intelligent understanding of the health department through the appointment of a representative local committee of lay persons who, in performing their duties, learn at first hand of the achievements and needs of the health organization. The members of the Grading Committee study the analysis made by the medical officer and transmit to him their findings. This report and the visit made to the unit by a representative of the Grading Committee, have proved very helpful in the development of better local health services.

There is every reason to hope that practically all the eligible health units will participate in the second Canadian rural health conservation contest. The fact-finding schedules are to be returned as soon as possible after the close of the calendar year, but not later than March 15, 1939.

# REPORT OF THE ASSOCIATION'S WORK DURING 1937

## Part IV

### FIFTH ANNUAL REPORT OF THE COMMITTEE ON CERTIFICATION OF CAUSES OF DEATH

THE Committee on the Certification of Causes of Death was formed five years ago for the purpose of considering ways and means for improving vital statistics as relating to the certification of causes of death. For some time before the formation of the Committee, the Dominion Bureau of Statistics and several of the provincial registrar generals and provincial health officers had given careful consideration to the possibility of revising the form of the medical statement on the Canadian death certificate. The Committee conducted an intensive study through the co-operation of the Department of Epidemiology and Biometrics of the School of Hygiene, University of Toronto, and practical trial was made of several forms of the medical statement. As a result of the findings of the Committee, their recommendations concerning the form of the medical certificate were approved by the Section of Vital Statistics and adopted by the provincial registrars and the Dominion Bureau of Statistics. The new Canadian death certificate was introduced in January, 1935.

The experience of the past four years has shown that the form of the new certificates does elicit from the physician a clearer statement as to the cause of death. It is being more generally understood by physicians that the cause of death which is to be recorded in medical statistics is the cause that initiated the train of events leading to death. The present form of the medical statement encourages the physician to present his statement in such a way that the cause of death, so defined, is indicated.

The Committee appreciates fully that the desired improvement in the certification of causes of death would not be achieved unless the medical profession were properly informed regarding the use of the new certificate. Two suitable articles were published, with the co-operation of the Dominion Bureau of Statistics, in the Canadian Medical Association Journal, the Canadian Public Health Journal, the Manitoba Medical Association Review, and the Nova Scotia Medical Bulletin, and suitable reference was made in the Bulletin of the Provincial Board of Health of British Columbia and the Bulletin of the Academy of Medicine, Toronto.

#### SECTION I. EDUCATION OF MEDICAL STUDENTS IN THE PRINCIPLES AND PRACTICE OF DEATH CERTIFICATION

Among the recommendations made by the Commission entrusted with the revision of the International List in 1929, it was pointed out that "it was of the

utmost importance that medical practitioners and medical students be given special instructions as to the principles governing death certification." It was therefore with a clear realization of the need and the feeling that a contribution might be made toward improving medical certification, if medical students during their courses of instruction had an opportunity of learning the essentials of proper certification of deaths, that an exercise on death certification for medical students was first prepared by the Committee two years ago. After a period of trial extending over two years this exercise has been prepared in printed form. The Committee appreciates the arrangements for the distribution of these exercises to the faculties of medicine in medical schools throughout Canada. This year all nine Canadian medical schools will be using this plan of teaching the fundamentals of death certification and the essential principles of vital statistical practice to medical students. The plan will undoubtedly do much toward improving the certification practice of the medical profession by preparing the young graduates in the use of the medical certificate. It is a source of gratification to this Committee that Canada is the first country to implement the recommendations of the Commission entrusted with the revision of the International List in 1929.

## SECTION II. THE CURRENT USE OF THE NEW MEDICAL CERTIFICATE

The current use of the new medical certificate of cause of death shows much improvement over that recorded in the Committee's first study in 1935. There are still many defects in certification, defects which are due to failure to adhere to the method of procedure indicated in certifying cause of death, defects which defeat the objective of the new form, namely to make possible a clear statement of the physician's considered opinion as to the cause of death in each individual case.

The education of medical students in the principles and practice of death certification is fundamental but cannot be expected to influence materially the returns or the attitude of the profession as a whole for perhaps some time. The articles prepared for the Committee at the time of the introduction of the new form have undoubtedly been helpful. The publication by the Dominion Bureau of Statistics in 1936 of a new Handbook on Death Registration and Certification was a great contribution in the direction of improved registration and certification. This Committee feels, however, that every effort should be made to supplement what has already been done and to present to the profession at every opportunity the nature of present errors and difficulties in certification in order to assist in clearing up the difficulties which exist.

The Committee appreciates the fact that it is often quite difficult to complete a satisfactory medical statement of cause of death and feels that everything should be done to assist physicians in this respect. Many physicians do not realize the importance of properly recorded medical statements, nor perhaps the practical use which these records can be put to by the profession. It should be the Committee's objective to seek every opportunity to impress upon the profession that a large measure of present difficulty lies in recording on the death certificate

conditions which are not important contributors to death. Unless a disease or condition played a significant part in the opinion of the doctor in death, it should not be included in the death certificate at all. The certificate of cause of death should not be regarded as an abstract of the clinical history and pathology findings, but a terse authoritative scientific statement of the cause of death.

The Committee observes that the Washington Bureau of the Census has been undertaking a review of the birth and death certificates in all States in the Union prior to a consideration of revision of the standard forms, particularly the questions relating to cause of death on the medical certificate.

During the year the Secretary of the Committee, Dr. A. H. Sellers, to whom the members of the Committee are indebted for the conduct of much of the detailed studies, presented a résumé of the Canadian death certificate at the annual meeting of the American Public Health Association in New York. A paper dealing with common errors in the use of the new medical certificate has also been prepared for publication in the Canadian Medical Association Journal.

### SECTION III. STILLBIRTH REGISTRATION AND CERTIFICATION

The important subject of stillbirths is presented by a sub-committee under the chairmanship of Dr. Sellers. It is significant that a special conference of the Section of Vital Statistics and Epidemiology has been called in Ottawa in June to consult with the Dominion Bureau of Statistics and the Department of Pensions and National Health regarding the introduction of a single form of registration for stillbirths. An essential part of satisfactory registration is the physician's statement relating to the cause of death. To assist in a suitable classification of causes of stillbirths, the sub-committee plans to conduct further studies next year so that it may be in a position to offer suggestions regarding a practical working classification. There can be no doubt that data on causes of stillbirth may provide some suggestions as to measures for reducing the present extent of this problem.

The adoption on a national scale of a standard stillbirth certificate and the replacement of the present double method of registration of stillbirths (except in Quebec) by the use of a single form, are recommended by the Sub-committee on Stillbirth Registration and Certification. There are substantial arguments in favour of such a change and any obstacles can undoubtedly be overcome. It will be necessary, of course, for the present provisions in the Vital Statistics Acts of the provinces to be revised. The Canadian criterion of a stillbirth as distinct from a live birth is absence of pulmonary respiration after complete birth. This is not the accepted legal criterion nor is it included in the accepted official definition of a stillbirth either in England and Wales or the United States. There is some doubt, however, as to whether it is wise to limit the registration to infants which reach 28 weeks' gestation because (1) the error in estimating period of gestation is a sizeable one, and (2) foetuses are reported as born alive before this time.

Considerable interest attaches to the extensive study of stillbirths now being undertaken by the Children's Bureau of the United States Department of Labour, particularly because of its manifest objectives of (1) research into the causes of stillbirth, and (2) the development of a new classification of causes of stillbirth for statistical purposes.

#### SECTION IV. CONFIDENTIAL DEATH CERTIFICATION

A second sub-committee is concerned with the so-called "confidential" death certificate. Under the chairmanship of Dr. Paul Parrot, Demographer of the Ministry of Health of Quebec, a study has been made of the accuracy of certification in Quebec. This important matter, which is receiving considerable attention in the United States, is to be discussed at the Section meeting in Ottawa. Meanwhile the Committee notes with interest that experimental work is being continued in the United States. The findings of these studies should help to guide developments along practical and scientific lines. The Sub-committee on the Confidential Death Certificate will present their report after the Section meeting and it will be published subsequently in the *Journal*.

#### SECTION V. THE WORK OF THE DOMINION BUREAU OF STATISTICS

Since the Committee's last report, four significant contributions have been made by the Vital Statistics Branch of the Dominion Bureau of Statistics which are of interest to the Section of Vital Statistics.

The first of these, Special Report on Occupational Mortality 1931-32, is the first ever published in Canada based on Canadian data. There can be no doubt of the general interest in this material, particularly on the part of industrial hygienists. It is hoped that further contributions of this sort may be made possible by the Bureau in the future.

The second contribution, Special Report on Mortality in Canada 1921-35, is quite comprehensive. The report covers a sufficiently long period of time for the material to be of definite value to everyone interested in public health.

The third report, dealing with Deaths in Canada Classified According to Place of Residence (Parts I and II), serves to supplement the previous publications by the Bureau in this field which dealt with births, general mortality and tuberculosis for the years 1930-32.

Following upon the recommendations of the Committee on Non-resident Births and Deaths of this Association, which was dissolved last year after six years of activity, the Dominion Bureau of Statistics has begun the routine tabulation of births and deaths by place of residence. During the past year, in addition to the publication of the data on deaths by place of residence, the Bureau issued its official rules for allocation by place of residence. These rules are essentially those previously indicated by the Bureau on a tentative basis and which were incorporated in the fourth annual report of the Committee on Non-resident Births and Deaths in June 1935.

Of special note during the past year was the publication of the first official life tables for Canada, referred to as Canadian Life Table No. 1, published in Census Monograph No. 13. This development is one of real significance, since there has been definite need for a Canadian life table for some time. Sociologists and medical statisticians, in addition to workers in the life insurance field, will undoubtedly appreciate the significance of this work.

Vital statistics in Canada have within a relatively short time attained a high standard. The production of nationally uniform vital statistics is in itself a singular achievement. This Committee wishes once again to place on record its enthusiastic commendation of the work of the Dominion Bureau in the field of vital statistics in Canada.

#### SECTION VI. REVISION OF THE INTERNATIONAL LIST OF CAUSES OF DEATH

Following a conference in Toronto in June 1936, at which suggested revisions in the International List of Causes of Death were discussed, the recommendations of the Committee were submitted to the Dominion Bureau of Statistics. The official draft of the recommendations forwarded to the Commission Mixté by the Dominion Bureau of Statistics followed almost entirely the recommendations of this Committee presented in 1936. The suggestions concerning the subdivision of rubrics 87, 90, 92, 93 and 95, to permit the segregation of rheumatic heart disease was also incorporated in the official recommendations to the Commission Mixté.

Mr. W. R. Tracey, Chief of the Vital Statistics Branch of the Dominion Bureau of Statistics, has kept the Committee constantly in touch with developments and an analysis of the revisions proposed by the various countries, prepared by the Committee on this question of the American Public Health Association, has been made available.

The Committee expressed the hope that Canada would be represented at the forthcoming decennial revision. It is gratifying that the revisions suggested by the Committee are being presented at the conference and that a representative of the Dominion Bureau of Statistics will in all likelihood attend this conference.

In the matter of the revision of the International List, the Committee has enjoyed the closest co-operation with the Committee on the Accuracy of Certified Causes of Death of the American Public Health Association. At previous revisions of the International List the Canadian representations were made through the American Public Health Association's Committee. The consideration given by our Canadian group to this important matter has resulted in a number of helpful suggestions, supplementing those presented by the committee in the United States.

#### SECTION VII. MORBIDITY NOSOLOGY

At the forthcoming meeting of the Dominion Council of Health, which will be held in Ottawa in June, the committee appointed by that body, with the

approval of the Department of Pensions and National Health, to study the question of morbidity classification, will make its second report, presenting at that time a suitable short list for use throughout Canada. This has been prepared in co-operation with the Dominion Bureau of Statistics.

In this connection, the work of Dr. F. S. Burke of the Department of Pensions and National Health, Ottawa, deserves special mention. Dr. Burke, in connection with his studies of the causes of morbidity among the civil servants, formulated a working classification of the causes of morbidity based on the International List. From this effort the work of the Committee developed. All of the members of this committee are members of the Section of Vital Statistics and Epidemiology. Efforts to obtain morbidity statistics, and the interest of the profession that must be secured in doing so, must of necessity result in improving the accuracy of the certification of causes of death.

The Committee feel that much remains to be done in acquainting practising physicians with the proper use of the present medical certificate and in increasing their interest in the subject of vital statistics. Realizing fully the limitations of vital statistics and their frequent faulty interpretation by writers of scientific articles, the fact remains that accurate vital statistics are the concern of every physician.

DR. R. D. DEFRIES, *Chairman*; DR. H. E. YOUNG, MR. E. S. MACPHAIL, DR. M. R. BOW, DR. WM. WARWICK, DR. PAUL PARROT, MR. S. J. MANCHESTER, MR. T. E. ASHTON, DR. E. GAGNON, and DR. A. H. SELLERS, *Secretary*.

#### RESOLUTIONS

1. WHEREAS the provision of special instruction in the principles and practice of death certification is essential in order to improve the standard of medical certification in Canada;

AND WHEREAS the faculties of medicine of all Canadian medical schools are now making provision for such instruction for medical students;

BE IT RESOLVED THAT this Section express its appreciation of the co-operation of the various faculties of medicine and urge their continued assistance in this respect.

2. WHEREAS the Dominion Bureau of Statistics has continued to extend its co-operation to the committees of this Section in connection with the various studies undertaken;

AND WHEREAS the Dominion Bureau has again this past year made further contributions of national interest in the field of vital statistics;

BE IT RESOLVED THAT this Section record its unqualified appreciation and commendation of the work of Dr. Coats and his colleagues for their continued service and inspiring leadership.

## LETTER FROM GREAT BRITAIN

GEORGE F. BUCHAN, M.D., F.R.C.P., D.P.H.  
*London*

### THE HEALTH CONGRESS, 1938

**T**HIS Congress, which was attended by some 2,000 delegates and others, was held in Portsmouth, one of the oldest and most interesting cities in England and the home of the Navy. The hotels all along the promenade at Southsea, the new seaside resort built up round the old city of Portsmouth, look out to Spithead, with its three quaint forts built for the defence of the city in the 17th century. With the ever-changing panorama of ships passing to and fro—battleships, aircraft carriers, torpedo boats, submarines and great liners—the view from the front is full of interest to visitors. A small steam launch takes passengers thrice daily for a trip round the harbour. Shortly after leaving the pier the old castle wall and the old fortifications of the city stretch out along the water front; then comes the landing place of Catherine of Braganza and in the distance is to be seen the tower of the church in which she was married to Charles II. On the shore of the Solent and nestling among trees, Haslar Royal Naval Hospital is a conspicuous landmark. The trip culminates with a visit to the Victory, Nelson's flagship of great renown and of entralling interest.

But it must not be thought that the main interest of the Congress lay in sightseeing, for each morning the various halls were packed with eager audiences listening to the varied papers on every aspect of public health and from the inaugural meeting in the Guildhall when the Right Hon. the Earl of Bessborough, P.C., G.C.M.G., was installed as President of the Congress, there was not a dull moment. The future of the General Hospital was presented from the point of view of Mr. Bedwell, House Governor, King's College Hospital, London. He stressed his agreement with the Brit-

ish Medical Association's conclusion that "while provision for the treatment of disease is an essential part of any satisfactory health service, the emphasis should rest on the positive prosecution of measures to maintain and enhance mental and physical health". The lecturer deprecated the movement which has been taking shape during the last few years which he described as the hospitalization of the community. He expressed the opinion that the voluntary hospitals should be left to their curative work, while the local authorities should devote themselves to the promotion of health measures. In his scheme the medical officer of health would become professor of preventive medicine on the staff of the medical school with established clinics where the future medical practitioner would obtain a correct perspective as to the relationship between preventive and curative medicine. The discussion was continued by the medical officer of health of Manchester, in which he gave his audience a glimpse of what had been accomplished in that city by the institution of a central or clearing clinic staffed by specialists. Here, after a thorough examination, the patient is passed on to the appropriate hospital where suitable treatment for the condition is obtained. Much the same arrangements prevail at Oxford but the impression gained ground in the discussions which followed that while such a scheme might be carried out successfully in Manchester or Oxford, the difficulties of getting the same facilities for rural areas were almost unsurmountable.

The paper on "Rheumatism and the Public Health", by the Right Hon. Lord Horder, G.C.V.O., M.D., F.R.C.P., gave an outline of the work and policy of the Empire Rheumatism Council. Investigations into rheu-

matism by the Ministry of Health and the Medical Research Council, reinforced by parallel efforts in other countries, have established the fact that rheumatic disease is the most formidable foe of public health in the countries of high civilisation. In England and Wales it accounts for 16 per cent. of the total incapacitating illness among the industrial population and in other parts of the British Empire, U.S.A., France, Germany, Belgium and Denmark, the percentage is round the same. The Empire Rheumatism Council is endeavouring to enlist to the utmost degree possible the medical resources and administrative ability of the empire for a co-ordinated campaign to seek out the causative factors in rheumatic disease and the most efficacious means of treatment. In the opinion of Lord Horder the healthy home, the healthy workshop, climate, pure air, sunlight and nutritious food will all be found to have notable relation to both causation and treatment in this problem of rheumatism. It is not expected that a standardised system of treatment will be evolved but it is hoped that the council may be able shortly to indicate what class of remedial measures will be most appropriate to certain types of rheumatic trouble.

The Annual Health Congress is a feature of health work in England as it provides the necessary occasion when members of local authorities, medical officers of health, consultants and general practitioners can confer with one another and understand the many aspects of any public health problem. The Congress at Portsmouth was a great success and the arrangements made for the enlightenment, comfort and entertainment of delegates were greatly appreciated by all those present.

#### NATIONAL CONFERENCE ON MATERNITY AND CHILD WELFARE

THIS, the chief annual event in child welfare in England, took place this year in Bristol and was attended by 800 delegates. To the attractions

of the conference were added those of the ancient and beautiful city, which gave it welcome and hospitality and which, apart from its historic and commercial fame, proved to have several interesting associations. It was in Bristol, for instance, that the first voluntary hospital in England was established and this municipality was the first to seek powers to levy a rate for the relief of the poor. Its Theatre Royal in King street, which still functions, is one of the oldest in the country. Bristol is the birthplace of the first English pioneer woman doctor, Dr. Elizabeth Blackwell, and it was in a public house on the quay that Robert Louis Stevenson made acquaintance with the sailor who was to figure as John Silver in *Treasure Island*.

The subject matter for discussion for this year included the psychology of pregnancy in relation to the falling birth rate, physical fitness in young children, co-operation between school medical and maternity and child welfare services, convalescence for children under five years, parentcraft teaching and a consideration of 20 years of child welfare—in retrospect and prospect.

In his presidential address, Mr. R. H. Bernays, M.P., Parliamentary Secretary to the Ministry of Health, was able to tell the conference that the maternal mortality rate for 1937, 3.11 per thousand, was the lowest since the beginning of the century, and that the decline in the birth rate had been arrested.

Apart from discussions on the other main problems facing child welfare workers at the present time—the persistently high neo-natal death rate, the care of the pre-school child including provision of nursery classes and schools and the care of 18,000 foster children in England—an important point that emerged was a new problem that is arising all over the country, partly as a result of the Midwives Act of 1936 and partly because of the success of previous work in child welfare and the propaganda in connection

with physical fitness. This is the attendance at Maternity and Child Welfare centres of increasing numbers of mothers and children without a corresponding increase in space and in staffing. Waiting room and consulting room accommodation is overtaxed and doctors and health visitors are unable to overtake the work in the time available. Not only on the platform, but during visits and private discussions, this matter recurred and fears were expressed that the standard of work would be lowered and especially in ante-natal work, dangers would arise unless local authorities appointed extra staff and provided the necessary space and equipment to enable the public to receive the health services they demand.

#### ANNUAL REPORT OF THE MINISTRY OF HEALTH, 1937-38

THE report is the nineteenth of the series as the Ministry of Health for England and Wales was established in 1919. It is submitted to the King's Most Excellent Majesty by the Minister of Health. The report covers the whole field of work of the Ministry of Health, including Public Health, Public Assistance, Housing and Town Planning, Local Government, National Health Insurance and Pensions. I propose, however, in this letter to confine my attention to the public health work.

The report made its appearance in August and records that in the field of maternity and child welfare the year has been noteworthy for a substantial fall in maternal mortality to the record low level of 3.11 per 1,000 births. The number of mothers who attend ante-natal clinics continues to rise, as does the number of babies attending welfare centres. During the year local authorities have been engaged bringing into operation their arrangements for providing service under the Midwives Act 1936. Every authority now has salaried midwives, in whole-time service, who act as midwives or maternity nurses in the patients' homes. Some authorities

have directly employed midwives themselves and others entered into arrangements with voluntary organisations. The salaries of midwives are comparable now with those of health visitors. The new rules of the Central Midwives Board coming into force in the autumn of this year provide for one year's midwifery training in the case of trained nurses instead of six months, and two years' training in all other cases instead of one year. Although the infant death rate is low, being only one above the record low figure of 57 in 1933, the neonatal death rate remains the same. It is to be hoped that the operation of the new midwifery and maternity services may have the effect of lowering this. Health visitors visited nearly 98 per cent. of the notified births and nearly 20,000 more infants under one year of age visited welfare centres than in 1936.

From time to time short historical notes on the origin and growth of a particular service appear in the annual report and this year the tuberculosis service is the chosen. From a standardised death rate of 3,638 per million in 1851-55, there has been a fall to 657 per million in 1937. The service in England may be considered in recent years as having entered a period of consolidation and modernisation. The number of contacts examined is increased by 6,000. There were 10,000 more consultations between tuberculosis officers and medical practitioners. The number of x-ray examinations is just double the figure for 1933. Still the number of cases notified posthumously is too high. During the winter of 1937-38 one month was devoted to publicising the tuberculosis service in the national campaign to promote the wider use of health service. Both for tuberculosis and venereal disease there are complete services for early diagnosis and treatment. It is stated in the report that what is now needed to produce a substantial fall in the figures for both diseases is wider education of the

public so that greater use is made of the services provided.

There were four cases of smallpox and three of variola major in the year, with no death. A substantial increase in the number of cases of pneumonia notified was partly attributable to an outbreak of influenza early in the year. The number of cases of typhoid fell from 2,490 in 1936 to 2,149 in 1937. There were 206 deaths. Two outbreaks of typhoid fever occurred, one at Somerset in January, 1938, and the other, the much publicised Croydon epidemic of October, 1937. The report on the Croydon epidemic criticizes the lack of understanding and lack of communication between responsible officers of the Town Council, the ignorance of the cessation of chlorination on the part of the Borough Engineer, whose duties were too multifarious for him to give detailed personal attention to water supply, and the fact that the men selected for well work were not medically examined. The number of cases of diphtheria fluctuates from year to year and there is no evidence of a general decline in its incidence. In 1937 there were 3,546 more cases than in 1936. The number of cases of scarlet fever has fallen steadily since 1934 when there was an exceptional number of cases.

In sanitary services it is not possible to rest on past achievements and local authorities are constantly looking ahead and making provision for future needs. Substantial progress has been made in the provision of water supplies in rural areas. The Physical Training and Recreation Act 1937 gives wider powers to local authorities enabling lands to be acquired for playing fields, camps and other objects. A greater acreage has been purchased this last year than previously, many authorities being anxious to preserve the green belts on the fringes of cities.

The taking over of the institutional resources of the Boards of Guardians and their conversion into public health hospitals has been carried out

more easily by the County Boroughs than by County Councils. London County Council is an exception, having taken over 38 such institutions. County Councils were in a less favourable position in many cases since their institutions were small country institutions and in many counties there was no single institution or even part thereof which could readily be appropriated as a public health hospital. One hundred and nine hospitals containing a total of 57,318 beds have been appropriated as general hospitals, 49 by County Boroughs and 60 by County Councils, of which 38 belong to the London County Council. Nevertheless, the County Councils are steadily proceeding with a task which involves large building proposals, and the general rate of progress is on the whole satisfactory.

The year has seen a decrease in the number of blind children recorded and a large reduction in the number of persons relieved by public assistance. In housing occurred a great advance in the work of moving people from the slums. A watch has been established at airports to prevent the introduction of infectious diseases by air-borne traffic. New legislation has made available to boys and girls between the ages of 14 and 16 the medical benefits of National Health Insurance and has provided a scheme of pension for black-coated workers who are outside the scope of compulsory insurance.

In presenting the report the Rt. Hon. Walter Elliott, M.P., Minister of Health, claims that it shows a steady improvement in the health of the people and he claims this justly.

#### THE HEALTH OF SCOTLAND

THE report of the Department of Health for Scotland for 1937 was issued recently. The report is addressed to the Secretary of State for Scotland as there is no separate Minister of Health for Scotland as there is for England and Wales. The report discloses that admirable work has been done during the year.

Scotland has a population of nearly five million people. The death rate for 1937 was 13.9 per thousand of the population and it has ranged round this figure within recent years. The maternal mortality rate of 4.8 per thousand births is well below the average and indeed is the lowest yet recorded for Scotland. The infantile mortality rate of 80 per thousand births is somewhat lower than that for recent years, although not appreciably so. The report deals in detail with what may be called the outstanding public health event of the year, namely, the passing of the Maternity Services (Scotland) Act, 1937. The general object of the Act is to secure, so far as is reasonably practicable, that the standard of domiciliary maternity services is comparable with that of the institutional maternity services. Arrangements will be made under this Act whereby there will be available to any woman who is confined in her own home the joint services of a medical practitioner and a certified midwife throughout pregnancy, labour and the lying-in period. An expert obstetrician will also be available at any time should the practitioner require his services. The Scottish Local Authorities are at present engaged in the preparation of their schemes under the Act, which it is hoped will achieve still further reductions in both maternal mortality and morbidity.

The report has also considerable sections on housing, general sanitation, food, school medical inspection, infectious diseases, hospitals, national health insurance and the welfare of the blind. An interesting section dealing with a service which is peculiar to Scotland, namely, the Highlands and Islands medical service, is worthy

of mention. It shows how by the provision of houses for doctors and nurses in the remote regions of Scotland and by means of wireless and telephone communication and aeroplanes and ambulances the most modern facilities in modern science are made available to the Highlanders and Crofters in the most inaccessible parts of North Britain.

A feature of the report is the fantastic title of the first chapter, which is called "The New Public Health". As I have been dealing with public health now for some thirty years I read this chapter with considerable interest to find out what this discovery of the new public health really was. I found nothing new in the chapter at all. It merely describes the growth of public health and the re-orientation of our views regarding health which has been gradually taking place since 1875 when the public health officer was mainly engaged in improving environmental conditions. Now, of course, personal hygiene and the development of hospital services have become the main features of public health in Scotland as in other parts of the British Isles, as a result of many Acts passed by Parliament since the beginning of the present century. Fortunately, there is some new development in public health every year, and I hope this progress may continue until better and better health is achieved and the problem of how to secure, protect and maintain health is solved. In striving towards this objective it is certain many new paths will be explored, but it is also equally certain that such well-worn paths as those leading to the improvement of environmental conditions will continue to be used.

## PLANS, PROGRAMS, AND PROGRESS

### THE SEVENTH ANNUAL CHRISTMAS MEETING OF THE LABORATORY SECTION

**A**NNOUNCEMENT has been made of the holding of the seventh annual Christmas meeting of the Laboratory Section in Toronto on December 19th to 21st. The dates selected were approved by the great majority of members. An enquiry indicated that only a few preferred to have the meeting held during the week after Christmas.

Formal papers will be presented on Monday and Tuesday. It is expected that Dr. John Gordon, Professor of Hygiene and Preventive Medicine of Harvard University, will be the guest speaker. Dr. Gordon's study of scarlet fever in Rumania is well known. The program on Monday evening, following the annual dinner, will be devoted to a symposium on the streptococcus. Dr. Gordon's address will be presented at that time. Demonstrations will occupy Wednesday.

The program committee is providing a special session in non-medical bacteriology. This session will provide an opportunity for those who are engaged in the bacteriology and chemistry of milk, other food products, water, and soil. It is planned also to develop a special subsection to provide for the presentation, at future meetings, of papers in these fields.

The closing date for submitting titles of papers is October 30th.

Provision has been made for the publication, in the January issue of the Journal, of more extended abstracts of from 500 to 1,500 words. Synoptic tables may be included if desired. The publication of longer abstracts than in previous years will increase the value of the presentation of papers at the meeting. Abstracts must be submitted by November 30th.

Last year's attendance of one hundred and twenty-five is expected

to be exceeded, as the meeting is now recognized as the occasion for the presentation of new work in the fields of bacteriology, pathology, chemistry and parasitology as related to public health.

### APPOINTMENT OF THE HONOURABLE PIO H. LAPORTE AS MINISTER OF HEALTH AND WELFARE, NEW BRUNSWICK

FOLLOWING the death of the Honourable William F. Roberts, M.D., Minister of Health and Labour for New Brunswick, Dr. Pio H. Laporte



THE HON. PIO H. LAPORTE, M.D.

of Edmundston has been appointed to occupy this position in the Cabinet.

Dr. Laporte was born in Vercheres, Quebec, and was educated at L'Assomption College, receiving his degree in medicine at Laval University, Quebec. Following post-graduate study, Dr. Laporte received a higher degree in surgery at the School of Medicine, Paris. In his practice he has specialized in abdominal surgery. For the past twenty-five years he has been chief surgeon to the Hotel Dieu of St. Basile. He has taken an active part in organized medicine, having been a member of the Council of Physicians and Surgeons of New Brunswick since 1928. He is a past president of the Medical Society of

Temiscouata, of the New Brunswick Médical Society, and a member of the Executive Council of the Association des Médecins de Langue Française de l'Amérique du Nord. In public life Dr. Laporte has taken an active interest in municipal affairs, having served the town of Edmundston as a member of the city council for ten years and as mayor for three terms.

#### RETIREMENT OF DR. GEORGE HILTON

HAVING COMPLETED thirty-three years of service with the Dominion Department of Agriculture as Veterinary Director General of Canada, Dr. George Hilton has resigned. Serving first as Chief Veterinary Inspector and since 1924 as Veterinary Director General, he carried forward the campaign for the eradication of bovine tuberculosis so effectively that the incidence of bovine tuberculosis in Canada does not exceed 3 per cent. Under his leadership a sound program for the control of contagious abortion in cattle has been developed. Dr. Hilton was also instrumental in establishing control of veterinary biological products offered for sale in Canada. Under his leadership the Health of Animals Branch of the Department of Agriculture has made excellent progress.

#### PHYSICIANS ENROLLED AT THE SCHOOL OF HYGIENE, UNIVERSITY OF TORONTO

THE FOLLOWING physicians have enrolled in the course leading to the Diploma in Public Health at the School of Hygiene, University of Toronto: Dr. P. Auger, New Carlisle, Que.; Dr. H. G. Baker, Montreal; Dr. M. H. Brown, Toronto; Dr. J. A. Carswell, Juneau, Alaska; Dr. O. Chabot, Ville Marie, Que.; Dr. L. A. Clarke, Port Dover, Ont.; Dr. R. Cote, Montreal; Dr. J. Gauthier, Shawinigan Falls, Que.; Dr. J. L. Gayton, Trail, B.C.; Dr. J. Gilbert, Granby, Que.; Dr. R. J. Macdonald, Vancouver; Dr. G. E. Maddison, Moncton; Dr. J. M. Mather, New Lowell, Ont.; Dr. B. Paquet, Quebec; Dr. K. E. Pratt, Toronto; Dr. L. E. Ranta, Toronto; Dr. J. H. Shaw, Charlottetown; and Dr. W. N. Turpel, Norway House, Man.

#### A NEW HEALTH UNIT IN ALBERTA

THE PROVINCIAL Department of Health of Alberta has established a third full-time health unit, with headquarters in Lamont. Dr. H. Siemens has been appointed medical director.

## BOOKS AND REPORTS

**Bacteriology, a Textbook of Micro-organisms.** Fred William Tanner, Professor of Bacteriology and Head of the Department, University of Illinois, Urbana. Third Edition, 510 + xiii pages, with 151 illustrations. 1937. New York, John Wiley & Sons, Inc., London, Chapman & Hall, Ltd. \$3.50.

THIS BOOK, now in its third edition, was written as a text for those studying bacteriology for the first time. The subject is developed logically, stressing the essential fundamentals and the general biological relationships. The material is presented in an interesting manner and reference is

made wherever possible to the practical application in everyday life. The book, however, is not to be regarded as elementary.

While no aspect of the subject has been omitted from consideration, all have not received equal stress. The chapters on food preservation and food poisoning are outstanding. On the other hand, medical bacteriology scarcely receives the attention it deserves. Admitting the author's feeling that pathogenic micro-organisms receive too often an undesirable emphasis, this feature limits to some extent the usefulness of the book.

The author is to be congratulated

on this interesting, readable volume, and on his initiative in bringing it up-to-date by this third edition.

F. O. Wishart

**A Method of Anatomy.** *J. C. Boileau Grant, M.C., M.B., Ch.B., F.R.C.S. (Edin.). William Wood & Company (a Division of the Williams & Wilkins Company), Baltimore, Md., 1937. 650 pages. \$6.00.*

THE OBJECTIVE of this book is to lead the student to approach the study of anatomy by correlating facts and "studying them in their natural relationships". A clear appreciation of the underlying principles involved in this as in any other field of study, certainly is an important aid toward acquiring new facts. In this respect, this volume departs somewhat in form and method from the usual traditional textbook of anatomy.

The medical student has usually approached this subject essentially by systems and certainly the memorizing of facts has been carried out in this way. Thus osteology, myology etc. constitute for the student the various subdivisions of his anatomical studies which he must master. This disjointed approach by the many students must not only render the subject much less interesting than it is, but also fail entirely to give a practical working knowledge of anatomy.

Throughout Dr. Grant's book, the human body is considered by regions, and surface anatomy is considered along with gross anatomy. Every effort is made in the text to reduce the facts to be learned to a minimum by expressing new facts and relationships in terms of ones already learned. Simple illustrations are used which any student can reproduce for himself and despite their diagrammatic character, these illustrations are accurate in essential details.

A METHOD OF ANATOMY has been written to serve as an aid in making the study of anatomy interesting and practical. The method underlying Dr. Grant's presentation of the sub-

ject matter would certainly appear certain to achieve the objective. To the student the compact nature and the simplicity of the text and descriptions will be exceedingly helpful. Perhaps the addition of coloured illustrations would be an improvement, but this is a minor point.

A. H. Sellers

**Fifty-Eighth Year Book, United Hospital Fund of New York, 1937. 48 pages. (370 Lexington Ave.)**

THE ANNUAL REPORT of the United Hospital Fund of New York for 1937, contains much of interest even for the casual reader. This organization is now in its 60th year and has a membership of 92 hospitals. The service activities of the Fund include many phases of hospital interest such as convalescence, medical social service, hospital accounting etc. The Associated Hospital Service, the pre-payment plan for hospital care sponsored by the Fund has grown to a membership of 500,000 persons and during the twelve months covered by the report three million dollars were paid to hospitals for the care of its members. The exhaustive hospital survey for New York was sponsored by the United Hospital Fund, and deals with the entire field of the organized care of the sick.

The section on News of the Year indicates the nature and scope of the various services of the Fund. The Hospital Information and Service Bureau has proved tremendously helpful as indicated by the 2,500 requests received for assistance during the year. A steady improvement in accounting methods in hospitals has been observed since the organization by the Fund of the New York Conference on Hospital Accounting. The Report also includes a statement by each Committee and appendices containing personnel of the various groups concerned with the activities of the organization.

A. H. Sellers

